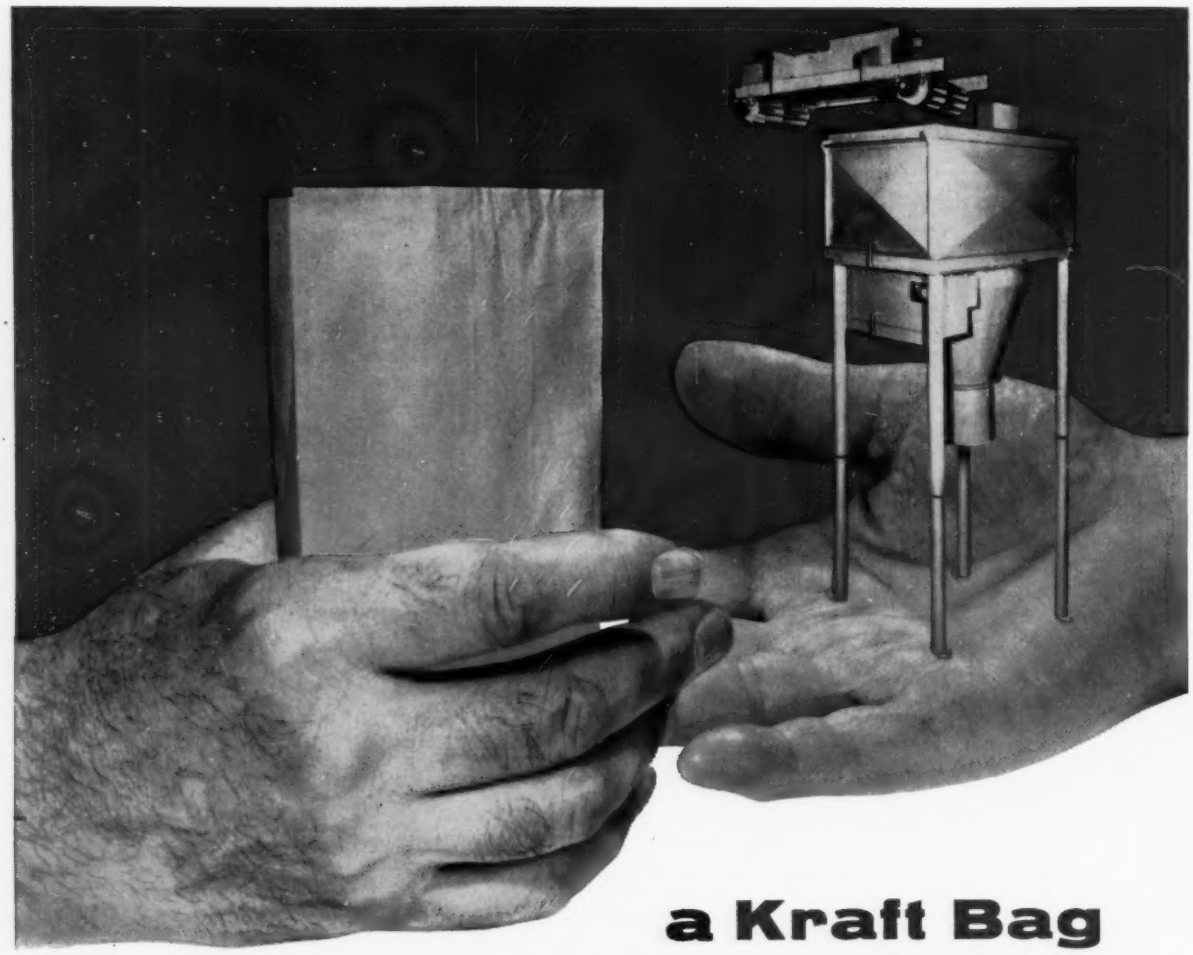
October
1961

COMMERCIAL FERTILIZER

and PLANT FOOD INDUSTRY



a Kraft Bag and The Kraftpacker *automatic open-mouth bag filling machine* go hand-in-hand!

Each does a good job by itself, and you can buy one without the other ... but working together as a team you get a packaging combination that is hard to beat for dependability, efficiency and sound economy.

The **KRAFT BAG** Div.
St. Marys Kraft Corporation, subsidiary of
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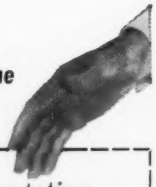

We'll be glad to see your representative.
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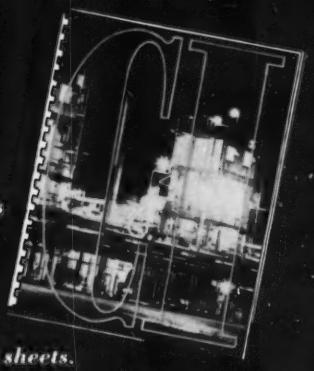

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✦

COMMENTING FREELY

by

Bruce Moran

The Secretary of Agriculture makes a good point when he says that our amazing ability to grow food is our secret weapon. Echoing Napoleon, who said an army moves on its stomach, he cites the poor agricultural showing made by Russia, where belts are all too often tightened.

But he makes another interesting point, in a quote sent us by International Minerals & Chemical from their IMC World house organ: Privately owned farms in the USSR produced 65% of Russia's potatoes, 82% of its eggs, 50% of its green vegetables. But private farms are less than 5% of the total USSR farm acreage.

Six million US farmers produce 60% more than forty-eight million Russian farmers, on 33% less planted acres . . . a comparison which Orville Freeman justly calls "of almost staggering significance." It is all of that. And it adds up - to return to our original thought - to the reason for our secret weapon.

COMMERCIAL FERTILIZER and PLANT FOOD INDUSTRY

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Established 1910

contents

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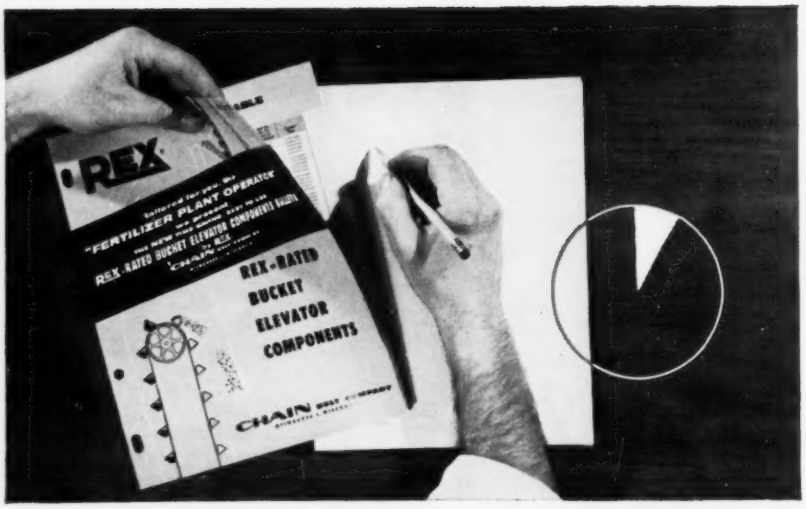
NOW SELECT BUCKET ELEVATOR COMPONENTS IN LESS THAN FIVE MINUTES



New Rex Selection Tables condense 70 years' experience into a simple 5-minute guide

Here's the fertilizer industry's quickest, simplest way to select the correct components for your bucket elevators.

It's not only fast—it's accurate; it's easy! In a few simple steps it leads you to the equipment that will meet your specific service requirements most economically: chains, buckets, sprockets, bearings and take-ups.

All you have to know are the type of material you are handling and your required volume and lifting height. You just feed this basic information into the Rex Selection Tables. Here your requirements are fully analyzed—and out come your selections, clear and correct.

Rex Selection Tables are contained in the new Rex Rated Bucket Elevator Components Bulletin No. 6057. Send for your free copy today.

CHAIN Belt Company, 4706 W. Greenfield Ave., Milwaukee 1, Wis. (In Canada: Rex Chainbelt (Canada) Ltd., Toronto and Montreal)

REX®
CHAIN BELT COMPANY

Please send my free copy of the Rex Rated Bucket Elevator Components Bulletin No. 6057, containing the Rex Selection Tables for selecting elevator components.

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Address_____

City_____ Zone_____ State_____

...and it has a pour-spout, too!

Here at last is a rip-open bag that has more to offer than mere speed! Sure, the new St. Regis® Grip 'N Rip bag opens fast (actually faster and easier than any bag of its kind). But there's more, lots more.

First, Grip 'N Rip has a unique pour-spout opening that can be custom-made to meet your needs. The glue under the top tape can be spaced to provide the exact size of pour-spout desired.

The pull tab on Grip 'N Rip is a triple-strength filter tape. Yet, one quick tug is all it takes and your bag is open. There's no thread to unravel either, as in competitive bags. And, you get all these Grip 'N Rip extras at a surprisingly low upcharge.

Grip 'N Rip is another example of St. Regis *Packaging-in-Depth*. This complete bag service assures you of the *right* bag, the *right* machinery to pack it, plus skilled engineering services. To meet your *future* needs, this program also includes continued research to develop improved packaging methods and economies.

PACKAGING-IN-DEPTH BY St.Regis BAG DIVISION

In Canada, contact St. Regis Consolidated Packaging Co., Ltd. PAPER COMPANY

Again...

New Solar nitrogen plant at Joplin, Missouri, dedicated to serving your nitrogen needs still better

The new Solar nitrogen plant at Joplin, Missouri, now extends Sohio service throughout the central part of the United States. The plant, constructed by Solar Nitrogen Chemicals, Inc., enables Sohio (acting as sales agent for Solar) to better serve the nitrogen needs of the fertilizer industry. It substantially increases availability of Solar nitrogen materials during peak seasons.

If you're a regular customer, you know that continuous improvements in service, delivery and product are SOP of the Solar-Sohio team. This leadership has contributed many "firsts" in the fertilizer industry during the past few years. In addition to the new Joplin plant, they have pioneered these improvements in service:

- First to give truck delivery of solutions and anhydrous.
- First to give bulk truck delivery of urea.
- A leader in the use of pressure, aluminum tank cars for nitrogen solutions.
- First to build large bulk storage to meet on-season demand of the industry.
- Further increased on-season availability by increasing capacity of Lima ammonia plant, urea unit and nitric acid unit.

Helping you solve fertilizer formulation problems is another area where the Solar-Sohio team can point to impressive achievements. For example, they...

Photographed July 29
before completion.

something new from the Solar-Sohio team

- Pioneered research in liquid fertilizer solubility.
- Devised practical but accurate shortcuts for methods of liquid formulation . . . i.e., triangulation formulation, formulation pads.
- Led in researching nitrogen solutions solubility and vapor pressure.
- Pioneered special high fixed-to-free nitrogen solutions for dry and liquid manufacturing for complete fertilizers.
- Led in promoting the use of urea-ammonium nitrate solutions to reduce formulation costs of liquid fertilizers.

We believe this record of leadership shows two especially significant facts about our company.

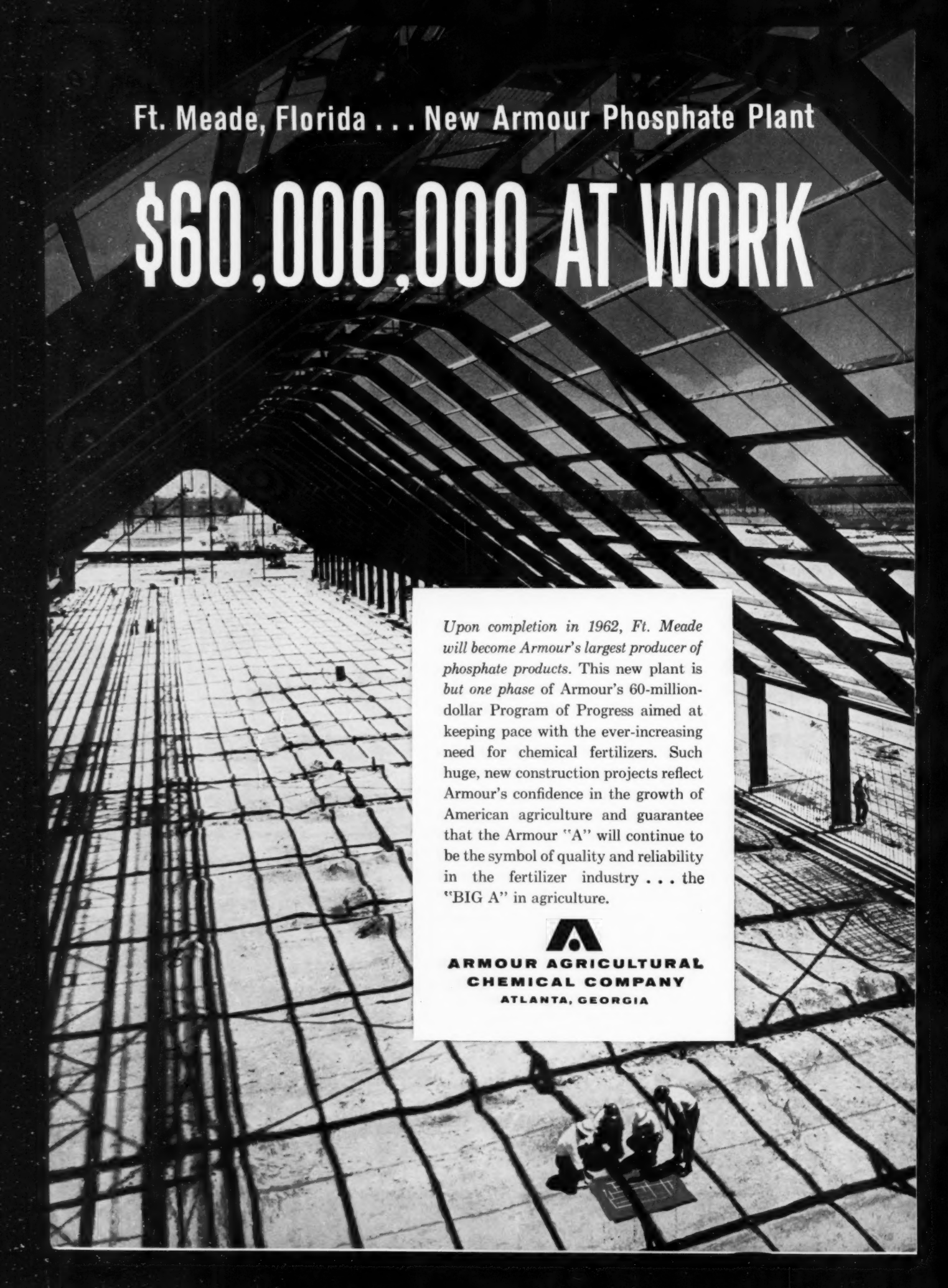
First is a genuine feeling of responsibility to serve your nitrogen needs as completely and as efficiently as we know how. Second is a thorough knowledge of agriculture . . . a real insight into your fertilizer formulation needs.

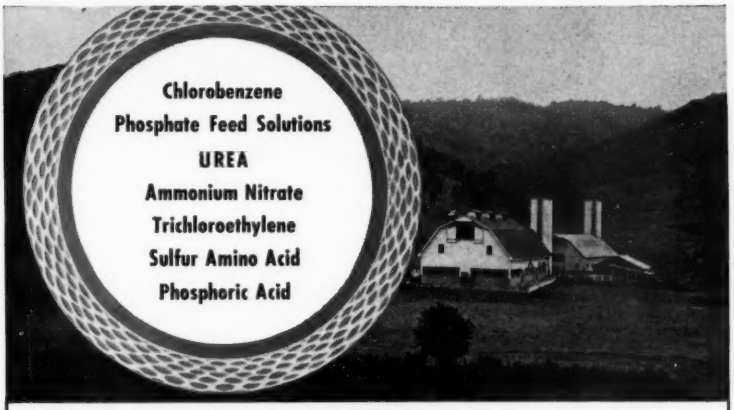
Right now is a good time to line up your future nitrogen needs. Call or write your "Man from Sohio" for a full line of Solar nitrogen products, including all grades of urea, ammonia and nitrogen solutions. Two plant locations assure dependable supply, quick delivery.

SOHIO

SOLAR NITROGEN CHEMICALS, INC.
Sohio Chemical Company, Agent
Sales Offices: Lima, Ohio and Kansas City, Mo.
Plants at: Lima, Ohio and Joplin, Mo.

A-12


Ft. Meade, Florida . . . New Armour Phosphate Plant
$60,000,000 AT WORK
Upon completion in 1962, Ft. Meade will become Armour's largest producer of phosphate products. This new plant is *but one phase* of Armour's 60-million-dollar Program of Progress aimed at keeping pace with the ever-increasing need for chemical fertilizers. Such huge, new construction projects reflect Armour's confidence in the growth of American agriculture and guarantee that the Armour "A" will continue to be the symbol of quality and reliability in the fertilizer industry . . . the "BIG A" in agriculture.
ARMOUR AGRICULTURAL CHEMICAL COMPANY
ATLANTA, GEORGIA

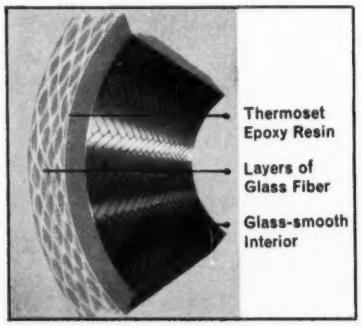


Fibercast Safely Carries Hard-to-Handle Chemicals—Corrosion is dangerous and costly. Fibercast effectively fights corrosion under temperature and pressure extremes that wilt most ordinary piping materials. With Fibercast pipe, you cut costs, increase efficiency, promote safety.

Corrosion problems in agricultural chemicals processing solved by Fibercast pipe

- *Copes with temperature range from −65° to +300° F.*
- *Withstands operating pressure range to 1200 psi.*
- *Handles 320 of 338 (94%) known corrosive solutions.*
- *Available now in pipe sizes from 2″ to 8″ with fittings.*

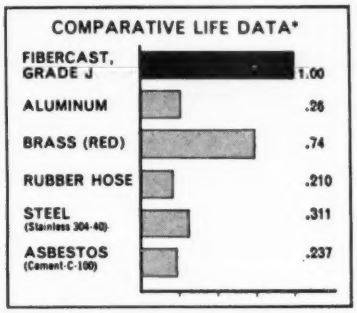
Fibercast owes its special resistance to heat, pressure and corrosion to the exclusive way it is built. Fibercast is a centrifugally cast, thermoset, epoxy resin glass reinforced pipe. Its woven glass fiber body provides resistance to high tension forces. These fibers are



centrifugally imbedded and bonded by heat in epoxy resin. The result is a strong, long lasting pipe, capable of solving the toughest problems of high pressure and temperature in corrosive environments.

Fibercast handles temperatures from −65° to +300° F. It handles pressures to 1200 psi. It is lightweight—about 1/5 the weight of steel. It is smooth inside and out, with a Hazen-Williams C Flow Factor of 147. It handles 94% of all known corrosive solutions. There is no other non-metallic pipe which will perform so well and last so long for so low a cost.

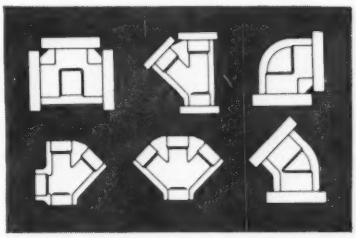
Further—strong, rigid Fibercast ends the danger problems caused by limp, dangling hose and the hazards of open flow lines. You not only get a superior piping system, but also a cleaner, neater, safer plant.



**Basing Fibercast as unit life of 1 and others as comparative percentages thereof.*

Ease of installation and a complete range of Fibercast fittings let you "tailor" piping to any needs. Design engineers and service representatives stand ready to help you plan and install the system that will cut costs for you.

Get the facts on corrosion control with cost-cutting Fibercast pipe. Send the coupon for full details.



FIBERCAST COMPANY, Dept. CF-101
Box 727, Sand Springs, Oklahoma

Please send me, without obligation, further details about Fibercast Pipe, Tubing and Fittings.

Name _____

Address _____

Title _____

Firm _____

Type of Business _____

City _____ Zone _____ State _____

FIBERCAST COMPANY A DIVISION OF **Youngstown SHEET AND TUBE COMPANY**

JUST AROUND THE CORNER

By Vernon Mount

INSURANCE against the political hazards of investment in foreign countries is a new idea. But we are in a new era, and it makes good sense—if we are going to continue building up the economies of underdeveloped nations.

SYRIA, which has parted with the UAR as this is written, is an example of how swiftly and unexpectedly a nation can change its philosophy of government, not to mention sinking its political leadership.

FERTILIZER plants, into which many, many US millions have been poured in lands occupied by what we used to call the "benighted heathen" are obviously and visibly financed by risk capital that is more than a little riskier than usual. A $10,000,000 ceiling on such guarantees will not cover many such investments. But it is a lot better than nothing when the chips begin to fall.

Yours faithfully,

Vernon Mount

41 plants...for prompt delivery of AA quality products

41 plants of The A.A.C. Co., located in the United States, Cuba and Canada, assure you dependable, fast deliveries of AA quality products for farm and industry. You can schedule your production with confidence . . . the right quantity and grade will be at your plant when you need it.

for uniform quality, prompt delivery and technical service . . . order from

The
American Agricultural Chemical
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Florida Pebble Phosphate Rock • Superphosphate
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All grades of Complete Fertilizers • Keystone® Gelatin
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Phosphorus and Compounds of Phosphorus

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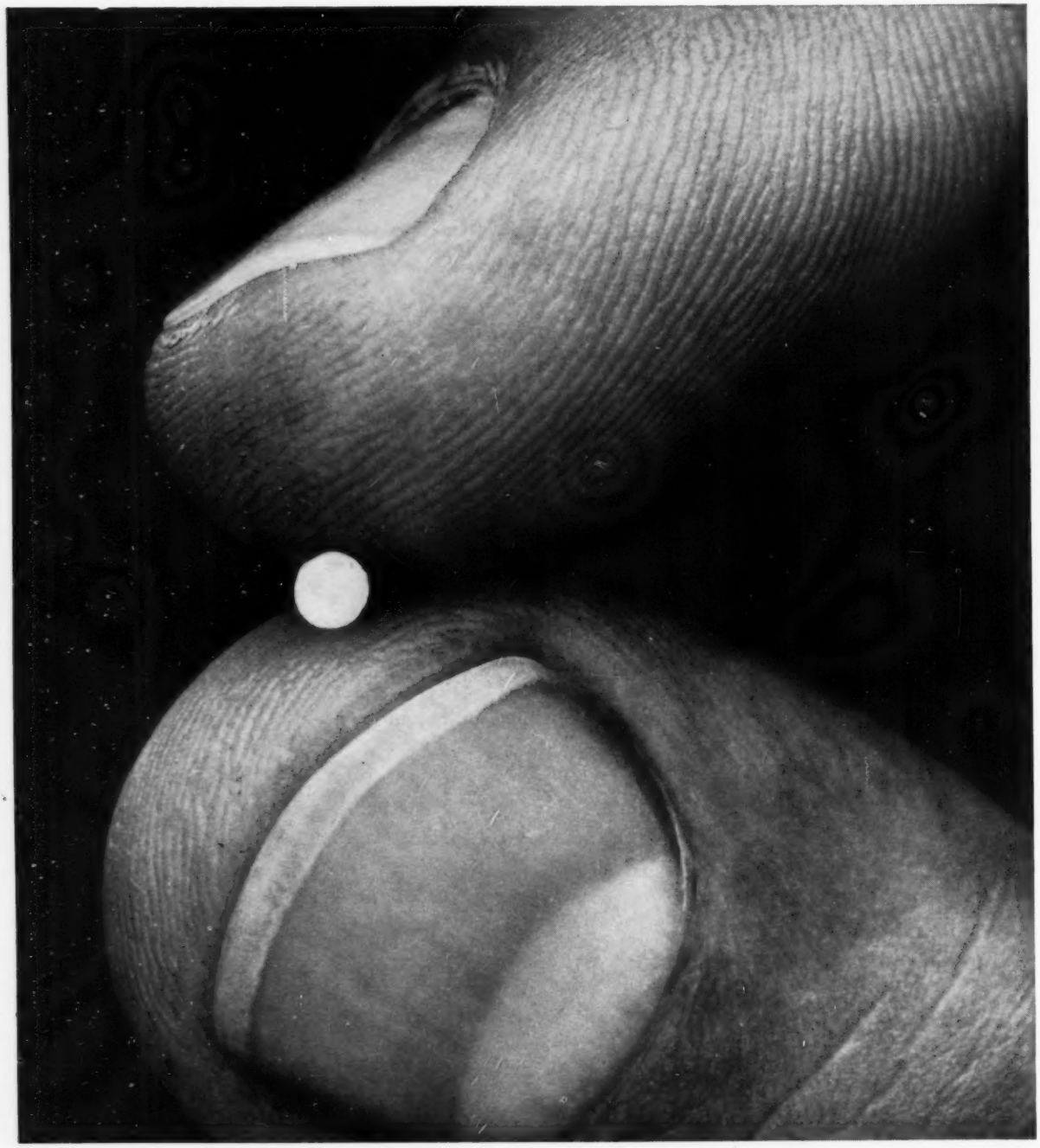


From little urea prills big fertilizer profits grow

This remarkable urea prill, produced by Cobalez of Belgium, is probably the most economical and efficient source of solid nitrogen material available in the world today.

Belgian urea prills give you a guaranteed 46% nitrogen. The price per unit of nitrogen is comparable with competitive solid materials. What's more, the nitrogen is concentrated in a compact, uniform unit. Result? Excellent distribution. Easier handling. Substantial savings on transportation and storage.

Belgian urea prills are uncoated, yet so skillfully made they contain less moisture than coated material. They're free flowing; there's no dust problem. And you get maximum solubility (you can dissolve 880 pounds in 100 gallons of water at 68°F.).

Is it any wonder H. J. Baker goes 3,000 miles to get them?

You can buy Belgian urea prills in America right now. In quantity. With fast delivery assured. As the first step in seeing how much better they can do the job for you—and how much bigger they can make your profits grow—send for a free sample and complete information. Simply write to the H. J. Baker office nearest you.

H. J. Baker & Bro., Inc.

733 Third Avenue, New York 17, N. Y.

Branch Offices: 208 South LaSalle Street, Chicago, Illinois • 501 Jackson Street, Tampa, Florida • 361 East Paces Ferry Road, N.E., Atlanta, Georgia.

Est. 1850

Discovered—an airtight multiwall!

Simple demonstration helps solve major packaging problem for Dow Chemical

The multiwall bag you see here contains nothing but air. The man standing on it weighs 200 lbs. Yet no air can escape. *That's because the bag is Union-Camp's amazing new UNISEAL.*

It ended a two-year search by Dow Chemical for a package that would provide a perfect vapor barrier.

Protection problem critical

The search began when Dow first developed an effective new crab grass killer. To successfully market this new product, an unusually tight package—even air-tight—was essential. The ideal package also had to be sturdy, printable, easy to handle and ship. And economical.

One day Dow engineers witnessed the UNISEAL demonstration you see above. If the bag could lock in air, then it must have the perfect vapor barrier. Further testing proved they were right.

Seals safely—and saves, too

The remarkable new UNISEAL bag features four plies. An outer sheet of semi-bleached paper (for top printability). Two middle plies of kraft. And an inner ply of kraft laminated to aluminum foil with polyethylene. A final extrusion coating of polyethylene resin over the foil serves as the heat-sealing medium for the inner seam and bottom.

The bag can easily be filled on *any standard filling equipment.* A special machine heat-seals the inner ply and applies adhesive to the tops of the outer plies. It then folds over the lip and pastes it to the outside of the bag. Finally, the machine centers a strip of gum tape over the edge of the lip to form a positive *air-tight* closure.

UNISEAL'S unique inner ply is made of kraft paper laminated with polyethylene to aluminium foil. Bags can be easily filled on any standard filling equipment.

Secret of sealing. Special machine heat-seals inner ply, folds lip over and pastes to outside of bag. Finally, gum tape is applied (arrow) forming a positive air-tight closure.

Apart from providing a perfect vapor barrier, Union-Camp's UNISEAL bag also turned out to be the least expensive container of any previously tried!

How much could a Union-Camp multiwall idea save you?

Hundreds of companies, large and small, have cut costs through Union-Camp multiwall ideas like this. Our comprehensive packaging service—5-Star Plan—covers bag construction, design, specifications control, packaging machinery and a survey of your plant. And it's free.

See your local Union-Camp multiwall man for complete details.

FREE 16-PAGE BOOKLET shows how packers like yourself have achieved greater economy in their multiwall packaging operations. Write Dept. UC 51-M

UNION-CAMP
MULTIWALL BAGS
Union Bag-Camp Paper Corporation 233 Broadway N.Y. 7, N.Y.

SYMBOLS OF PLANT LIFE

A 20TH CENTURY SYMBOL FOR HIGHEST QUALITY POTASH

In the middle ages, working with little help from prior research, alchemists frequently developed materials by accident.

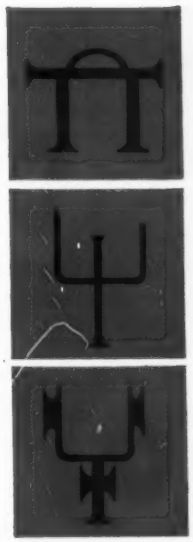
TODAY, MATERIALS ARE DEVELOPED BY PLAN TO MEET A NEED—JUST AS EACH TYPE OF HIGH-K MURIATE IS MADE TO MEET SPECIFIC REQUIREMENTS.

STANDARD HIGH-K MURIATE IS TAILOR MADE FOR CONVENTIONAL FERTILIZER MANUFACTURE AND VARIOUS RATIOS OF GRANULATED GRADES. IT FEATURES UNIFORM PARTICLE SIZE RANGE AND CHEMICAL ANALYSIS.

COARSE HIGH-K MURIATE IS USED IN THE MANUFACTURE OF CONVENTIONAL FERTILIZER AND IS ESPECIALLY USEFUL IN GRANULATION PLANTS. REASON: A CRYSTAL STRUCTURE WHICH DOES NOT BREAK DOWN WHEN ACIDS AND OTHER LIQUIDS ARE USED IN FORMULATION.

GRANULAR HIGH-K MURIATE IS A LARGER PARTICLE SIZE MURIATE FOR SPECIAL USE. SOUTHWEST POTASH PIONEERED THE PRODUCTION OF THIS ALL COMPACTED PRODUCT.

OUR PLANT PROCESSES ARE CONTINUALLY BEING MODERNIZED TO SUPPLY TYPES OF MURIATE NEEDED AND PREFERRED BY FERTILIZER MANUFACTURERS. ON SCHEDULE SHIPMENT, CAR AFTER CAR, DAY AFTER DAY, IS MAINTAINED THROUGHOUT THE YEAR.



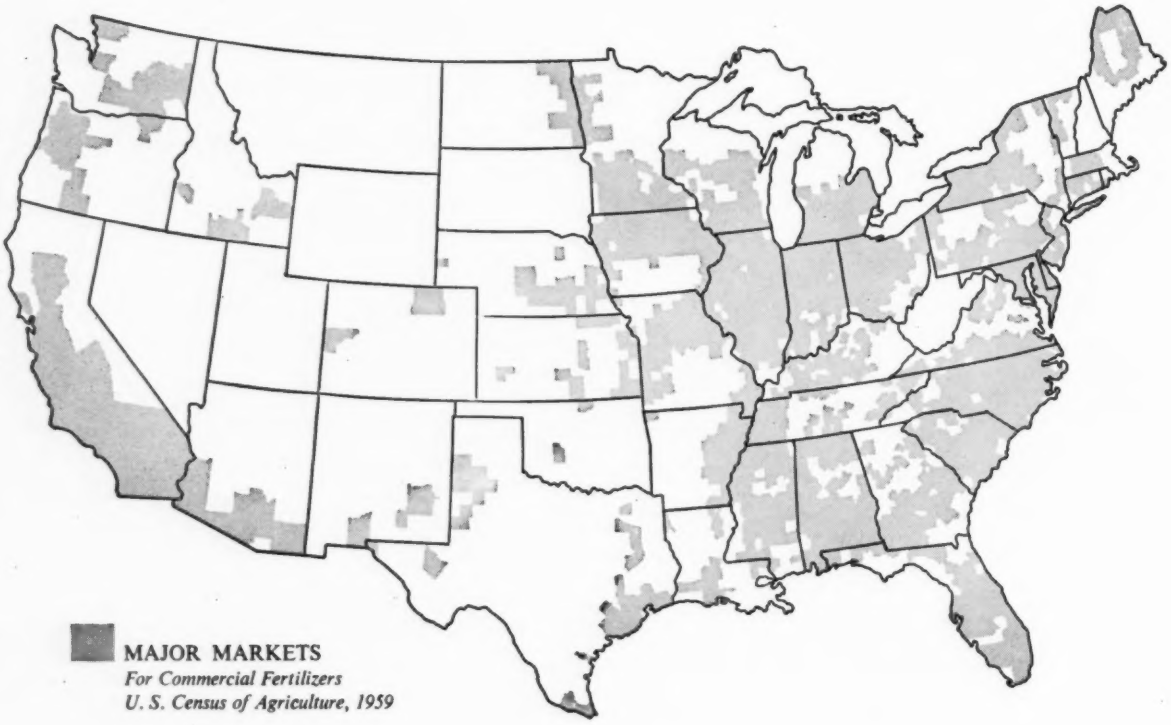
Medieval alchemists' symbols for potash and cribbled ashes

SOUTHWEST POTASH CORPORATION

1270 Avenue of the Americas, New York 20, N.Y.

Your use of FTE (Fritted Trace Elements) is

S-P-R-E-A-D-I-N-G



MAJOR MARKETS
For Commercial Fertilizers
U. S. Census of Agriculture, 1959

ONCE A REGIONAL SPECIALTY . . . FTE is helping produce better crop-yields this year in more than *forty* states. The big bulk of it is going into general high-productivity fertilizers, used on a wide variety of crops.

Containing all six minor elements—*boron, iron, zinc, copper, manganese* and *molybdenum*—FTE provides *protection* against secondary trace-element deficiencies while remedying specific soil problems. And but little is needed—often no more than 1% mixed into good fertilizers.

Unlike soluble salts that leach out in heavy rains, or become fixed in the soil under certain conditions, FTE releases the nutrients as needed *all through the growing season*. "Fritting" makes possible controlled, predetermined solubility. This, in turn, makes fertilizers more productive, more predictable, irrespective of growing conditions.

Ground almost talcum-fine, FTE mixes easily with other fertilizer ingredients. It will not cake or settle in storage and handling. Being *slow-soluble*, it presents no toxicity hazards—so can be *safely used anywhere, on all crops*, simplifying both manufacturing and marketing for fertilizer manufacturers.

There are many reasons why *you* should thoroughly investigate FTE before going into another selling season. Time is short. You have much to gain. Write for complete information and prices.

FERRO

FERRO CORPORATION *Agricultural Division*
4150 East 56 Street • Cleveland 5, Ohio

Arcadian® News

Volume 6 | Nitrogen Division, Allied Chemical Corporation | Number 10

ANNOUNCING two new ARCADIAN® Solutions for producing premium-grade fertilizers —

DURANA® 40

CHEMICAL COMPOSITION %							PHYSICAL PROPERTIES		
Total Nitrogen	Anhydrous Ammonia	Ammonium Nitrate	Urea	Formaldehyde	Water	Neutralizing Ammonia Per Unit of Total N (lbs.)	Approx. Sp. Grav. at 60° F	Approx. Vap. Pres. at 104° F per Sq. In. Gauge	Approx. Temp. at Which Salt Begins to Crystallize °F
37.0	14.6	29.0	32.0	16.0	8.4	7.87	1.198	0	36

U-A-S® F

40.0	26.0	0	40.0	16.0	18.0	13.0	1.051	24	55

DURANA 40 and **U-A-S F** are new and different ARCADIAN Nitrogen Solutions created for fertilizer manufacturers who wish to produce premium-grade complete fertilizers containing slowly-available, water-insoluble organic nitrogen. Through the proper use of these solutions in manufacturing complete fertilizers —

— approximately 40% of the total nitrogen from DURANA 40 is converted into water-insoluble methylene urea (ureaform) nitrogen.

— approximately 37% of the total nitrogen from U-A-S F is converted into water-insoluble methylene urea (ureaform) nitrogen.

This conversion to organic nitrogen takes place in the process of producing the fertilizer. In addition to organic nitrogen (methylene urea), complete fertilizers made with DURANA 40 also contain nitrate and ammonia nitrogen, and complete fertilizers made with U-A-S F also contain ammonia and urea nitrogen.

The agronomic value of these forms of nitrogen in complete fertilizers is well established. DURANA 40 and U-A-S F are particularly adapted to the production of premium grades, such as lawn and garden fertilizers and specialty fertilizers for crops such as tobacco, etc. Both of these solutions have been successfully tested.

In addition to supplying desirable forms of nitrogen, DURANA 40 and U-A-S F help give fertilizers excellent

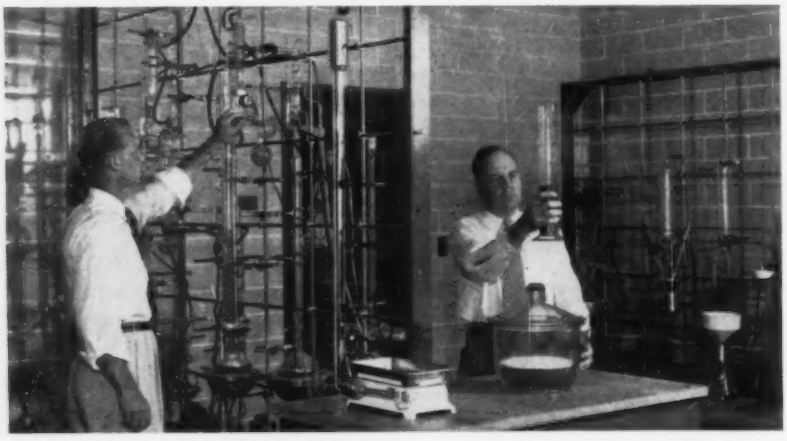
(continued on following page)

(continued from preceding page)

mechanical condition and facilitate the production of granular-type fertilizers. Each solution is ideally suited to the production of high-analysis fertilizers in ratios of 1-1-1, 2-1-1, 3-1-1 and higher nitrogen ratios.

You do not need to buy new equipment to use DURANA 40 or U-A-S F Nitrogen Solution. These new solutions are as easy to use through your existing equipment as your regular ammoniating solutions.

It will pay you to start now to produce premium-grade fertilizers containing slow-release (methylene urea) nitrogen, by using DURANA 40 or U-A-S F. These two new solutions are produced and sold exclusively by Nitrogen Division, Allied Chemical Corporation. They are products of Allied Chemical research – the same research that originated nitrogen solutions for ammoniating superphosphate more than 30 years ago. Through the years, this continuing research has brought you many new methods and materials for making better fertilizers. For information about DURANA 40 and U-A-S F and other ARCADIAN Nitrogen Products, contact Nitrogen Division, Allied Chemical Corporation.



Tips to Help You Get Accurate Formulation

Does the nitrogen content of your high-analysis fertilizers sometimes fail to meet minimum guarantees, despite the fact that you are using plenty of nitrogen in formulation? Are you forced to resort to excessive formulation to obtain your guaranteed nitrogen content? Have you detected the pungent odor of ammonia emerging from the exhaust pipe on the roof of your plant?

If you are faced with the problem of loss of nitrogen in ammoniation, it will pay you to take a careful look at your equipment and your methods.

In manufacturing pulverized or granular high-analysis fertilizers by batch or continuous mixing, failure to obtain the desired nitrogen content is often due to poor combination of ammonia with superphosphate and any added acids in the mixer.

Uniform distribution of the acid throughout the mass is just as important as uniform distribution of the ammoniating media. Uniform distribution insures effective utilization of all ingredients.

Efficient maintenance and use of correctly-designed distribution pipes are essential to uniform distribution of the acid and the ammoniating media. Correct techniques of operation must be observed to derive full value from your equipment.

A distribution pipe is basically a metering manifold and accuracy of metering ingredients is vitally important. This accuracy can be destroyed by corrosion and abrasion of the pipe. Corrosion and abrasion are cumulative and may pass unnoticed in their early stages unless a careful checking procedure is diligently maintained.

Improper use of acids and ammoniating media often causes the formation of many large particles too early in the ammoniation stage. This seriously limits further ammonia take-up by the superphosphate. Some of the unreacted acid may be buried inside these particles. Addition of more acid aggravates the situation and is a costly way of handling the problem. In extreme cases, it may also be dangerous.

Important Checkpoints

When your analyses indicate a loss of nitrogen in the ammoniation process, your first checkpoints should be: 1) Is your manpower efficient? 2) Are you using the proper distribution pipes and are these maintained in the best possible operating condition? 3) Are your formulation techniques correct for the fertilizers you wish to produce? 4) Are you using the ammoniating solution best suited to your methods and equipment?

Occasionally, loss of nitrogen occurs in the dryer. This may be due to excessive firing of the furnace as a result of poor installation or poor maintenance of the dryer. It may also be caused by forcing equipment beyond its capacity during periods of peak output.

In storage, there is seldom any appreciable loss of nitrogen from conventional formulae. When this does happen, a thorough appraisal of every phase of production should be made immediately.

Ask Nitrogen Division

When you have a formulation or an ammoniation problem, it will pay you to get the advice of a Nitrogen Division, Allied Chemical, technical service man. These men have a thorough knowledge of the entire operation of a fertilizer plant. They often assist in the selection of equipment and in the suggestion of more efficient, money-saving methods all along the production line.

This service is available to Nitrogen Division customers without charge. Get the facts from your Nitrogen Division salesman...or contact Nitrogen Division, Allied Chemical Corporation, 40 Rector Street, New York 6, N. Y. Phone: HAnover 2-7300.

NOTE: The information furnished in this issue of the ARCADIAN News is obtained from studies and tests considered reliable; results, however, are not guaranteed.

Arcadian News for Fertilizer Manufacturers from Nitrogen Division, Allied Chemical

Fifty percent earlier harvest of pulpwood from fertilized forest land than from unfertilized land provides a strong reason for forest fertilization.

Forest Fertilizer Know-How Beginning to Pay Profits

Fertilizing forest trees to get a bigger and faster harvest of pulpwood, timber and other wood products is now being practiced on a small scale in many states. It is the newest method of making wood production catch up with demand.

Increased planting of forest trees has been some help but, slow growth on poor soils, insect and disease damage and forest fires have been major detriments. Forest fires alone ruin trees on an area of 23 million acres a year, an area equal to the entire state of Indiana. We now have 489 million acres of commercial forest land and an annual growth rate of only 47 million board feet. Much of this land is not producing any appreciable growth worth harvesting. In 40 years, it is estimated we will need 80 to 100 million board feet a year.

Aerial Application

The first aerial application of mixed fertilizer to forest lands in this country was by Allied Chemical Corporation, in cooperation with Rutgers University, in 1956. This was used on a red pine stand on poor soil, and the fertilizer has greatly improved the growth and health of the trees. In Europe, Japan and other areas where wood is scarcer and more valuable than here, forest fertilization has been practiced for years. Fertilizer tests are now being conducted in many states of this country by state colleges, the U.S.D.A. Forest Service, and by pulp and lumber companies. Aerial application now makes it practical to fertilize standing timber quickly at a low cost of 1 to 2 cents per pound of fertilizer applied. Most applications have been at rates of 100 to 400 pounds per acre.

Market Potential

Forest tree nurseries are already using fertilizer, both to speed growth of seedlings and to produce sturdier planting stock that survives transplanting better. Lumber companies are finding that fertilization improves seed production and helps improve natural re-seeding as well as seed production for nursery planting. Pelleted fertilizer, for use in planting small trees, is also helping to make new plantations get a faster start.

The biggest single fertilizer market is standing timber. Trees need the same nutrients as other crops, though not as large a quantity. The best low-cost results will come from aerial application of fertilizer to trees growing on poor sandy soil, on badly leached or eroded soil in heavy rainfall areas, on land lacking humus, or where humus such as leaf cover on the soil is not rotting down into active form. Poor, burned-over, spoil-bank or cut-over land that is bare or has a weak "second-growth" will benefit greatly from fertilizer. When you consider that a large part of our forest and farm woodland is on soils not good enough for any other crop, you can see that there is a huge potential for fertilizer use. Estimates show that fertilizer can bring pulpwood stands to market within 20 years instead of the typical 30 years without fertilizer. On the other hand, slow-growing hardwoods of the Northeast—where investment is tied up for 40 or 50 years, and where close annual rings improve lumber quality for special markets—are the least promising market for fertilizer.

Kinds of Fertilizer

Different kinds of trees require different fertilizer ratios, and the same trees on different soils require different analyses. Nitrogen is essential in most forest fertilizer programs. In fact, nitrogen alone has worked well for increasing seed production of such trees as Douglas Fir. On sandy soils, potash is essential for most types of trees, and phosphorus is needed for new plantings of trees on most forest soils. The specific points on how to fertilize trees for profit are being worked out, but the answers aren't all in. Likewise, the number of fertilizer applications that pay on a tree crop before harvest still needs clarification.

It is not too early to stimulate forest fertilization in your sales area. The market is just ahead, and alert fertilizer men who take an interest in forest fertilization will capture this market. The demand for tree products keeps growing, and most forest soils lack sufficient plant food nutrients to produce the most profitable wood products.

Forest tree nurseries use large amounts of fertilizer.

The best N for your N-P-K

Arcadian® NITROGEN SOLUTIONS

	CHEMICAL COMPOSITION %							PHYSICAL PROPERTIES		
	Total Nitrogen	Anhydrous Ammonia	Ammonium Nitrate	Urea	Water	Nitrate N of Total N (%)	Neutralizing Ammonia Per Unit of Total N (lbs.)	Approx. Sp. Grav. at 60°F	Approx. Vap. Press. at 104°F per Sq. In. Gauge	Approx. Temp. at Which Salt Begins to Crystallize °F
NITRANA®										
2	41.0	22.2	65.0	—	12.8	27.7	10.8	1.137	10	21
2M	44.0	23.8	69.8	—	6.4	27.8	10.8	1.147	18	15
3	41.0	26.3	55.5	—	18.2	23.6	12.8	1.079	17	–25
3M	44.0	28.0	60.0	—	12.0	23.9	12.7	1.083	25	–36
3MC	47.0	29.7	64.5	—	5.8	24.0	12.6	1.089	34	–30
4	37.0	16.6	66.8	—	16.6	31.5	8.9	1.184	1	56
4M	41.0	19.0	72.5	—	8.5	30.9	9.2	1.194	7	61
6	49.0	34.0	60.0	—	6.0	21.4	13.9	1.050	48	–52
7	45.0	25.3	69.2	—	5.5	26.7	11.2	1.134	22	1
URANA®										
6C	43.0	20.0	68.0	6.0	6.0	27.7	9.3	1.180	12	39
6M	44.0	22.0	66.0	6.0	6.0	26.3	10.0	1.158	17	14
10	44.4	24.5	56.0	10.0	9.5	22.1	11.0	1.114	22	–15
11	41.0	19.0	58.0	11.0	12.0	24.7	9.2	1.162	10	7
12	44.4	26.0	50.0	12.0	12.0	19.7	11.7	1.087	25	– 7
13	49.0	33.0	45.1	13.0	8.9	16.1	13.5	1.033	51	–17
DURANA® (contains 8% formaldehyde)										
20	37.0	13.3	53.4	15.9	9.4	25.3	7.2	1.235	0	36
U-A-S®										
A	45.4	36.8	—	32.5	30.7	—	16.2	0.932	57	16
B	45.3	30.6	—	43.1	26.3	—	13.5	0.978	48	46
ANHYDROUS AMMONIA	82.2	99.9	—	—	—	—	24.3	0.618	211	–108

Other ARCADIAN® Products:
URAN® and FERAN® Solutions
Ammonia Liquor • N-dure®
A-N-L® • Ammonium Nitrate
UREA 45 • Nitrate of Soda
Sulphate of Ammonia

NITROGEN DIVISION

MAIN OFFICE: 40 RECTOR ST., NEW YORK 6, N. Y., PHONE HANOVER 2-7300

Allied Chemical

Hopewell, Va., P. O. Drawer 131 .....Glenview 8-6301
Ironton, Ohio, P. O. Box 98 .....Drexel 7-4366
Omaha 7, Neb., P. O. Box 166 .....29 1-1464
Raleigh, N. C., 704 Capital Club Bldg.....Temple 3-2801
Columbia 1, S. C., 1203 Gervais St.....Alpine 3-6676
Atlanta 3, Ga., 127 Peachtree St., N. E...Jackson 2-7805
Memphis 9, Tenn., 1929-B South 3rd St. Whitehall 8-2692
Indianapolis 20, Ind., 6060 College Ave. Clifford 5-5443
San Francisco 4, Cal., 235 Montgomery St...Yukon 2-6840

Consumption of

Commercial Fertilizers

and Primary Plant Nutrients in the U. S.

Year Ended June 30, 1960

by
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Fertilizer products marketed for farm and non-farm consumption and their primary plant nutrient (N, P_2O_5, K_2O) contents are reported for individual States including Alaska and Hawaii, the District of Columbia, and Puerto Rico, for the year ended June 30, 1960. Data on consumption of fertilizer in other possessions are difficult to obtain accurately and are insignificant when compared to the total for the United States. No estimates of consumption have been included for possessions not listed in the tables.

The data presented in tables 1 through 13 were based on information obtained from (1) fertilizer manufacturers on the tonnage of each kind and grade of product shipped to agents, dealers, and consumers, (2) distributors and custom applicators on shipments of anhydrous ammonia and nitrogen solutions, (3) manufacturers of base materials and brokers of products marketed direct to consumers, and (4) tonnage reports issued by States. Data for California, Florida, Massachusetts, Missouri, North Carolina, South Carolina, Texas, and Virginia, however, were obtained chiefly from the State tonnage reports.

The tonnages of fertilizer reported as mixtures and materials include all forms (bagged, blends, bulk, custom mix, granular, liquid, pesticide mixes, pulverized) marketed by the respondents indicated above. The tonnages of bulk-blends mixed by dealers and applicators are not included as such. But the quantities of products (mixtures and materials (used for blending by dealers and applicators are included in the reports of respondents who supplied the products.

The quantities of N, P_2O_5, and K_2O are based on the average analyses of samples of the products as reported by fertilizer-control officials of the respective State in which they were marketed, rather than on the manufacturers' guarantees. Thus, the overruns or underruns of nutrients are taken into account.

Quantities are reported as 2,000-pound tons. Although the data refer to shipments, the terms "consumption," "sales," and "shipments" are used synonymously. Actual consumption undoubtedly differs slightly from either shipments or sales.

Fertilizer

The kinds of fertilizer marketed for retail consumption are listed in table 1 with the amounts consumed in each region during the year ended June 30, 1960. These quantities do not include the amounts of these products used in the manufacture of commercial mixtures. The States comprising these regions are shown in table 2 together with the separate totals of commercial mixtures and of direct-application materials consumed in each. The total quantity of fertilizer consumed in the year ended June 30, 1960, was 24,877,415 tons. It comprised 23,499,286 tons of products containing one or more of the primary nutrients and 1,378,129 tons of secondary and trace nutrient materials marketed for retail consumption. Consumption of fertilizers containing primary nutrients was 590,058 tons (2.4 percent) below that (24,085,036 tons, revised) in 1958-59. The quantity of the secondary and trace nutrient materials was 154,914 tons (12.7 percent) more than the 1,223,204 tons used in the preceding year. The comparisons in the totals for 1959-60 to that in 1958-59 are based on data excluding Alaska as the amount of fertilizer consumed in that State was not available in 1958-59.

The decrease in the national consumption of primary nutrient fertilizers reflects the decreases that occurred in 31 of the 51 areas indicated (column 9, table 2). The majority of these areas were the larger users of fertilizer whereas most of the increases were in areas consuming relatively smaller tonnages of fertilizer. Of the 38 areas east of the Rocky Mountain region, decreases in consumption were recorded in 26 when compared with the preceding year. In the 11 areas comprising the Mountain and Pacific regions, all but three recorded an increase in consumption. In comparison with 1958-59, increases were as high as 15 percent (Kansas, Wyoming, Utah), whereas the maximum decrease was 14 percent (Missouri). Increases of 354,607 tons (5.0 percent) were recorded in areas accounting for 30 percent of the national tonnage, whereas consumption declined 944,665 tons (5.6 percent) in the remaining areas —a net decrease of 590,058 tons (2.4 percent). Although the trend to market products containing higher concentrations of primary nutrients tends to lower the gross tonnage, nevertheless, most areas in which decreases occurred also showed a corresponding decline in plant nutrient use (column 10, table 2).

The proportional decline in the national consumption of primary nutrient fertilizers was about evenly divided between mixtures and direct-application materials (table 3). The use of mixtures decreased 2.6 percent and that of materials 2.1 percent. A wide variation, however, is shown from these national means on regional and State levels and range from an increase of 25 percent in mixtures in the Mountain region to a decrease of 18 percent in ma-

* *The authors especially extend their thanks to Margaret A. Meiners who assisted in the tabulations.*

Table 1.—Kinds of fertilizer consumed, by region, year ended June 30, 1960[1]

Tons

Kind	New England	Middle Atlantic	South Atlantic	East North Central	West North Central	East South Central	West South Central	Mountain	Pacific	Alaska, Hawaii, and Puerto Rico	United States
MIXTURES	**346,028**	**1,749,468**	**5,018,460**	**3,398,621**	**1,562,587**	**2,078,131**	**714,080**	**92,106**	**417,924**	**272,217**	**15,649,622**
N-P-K	321,664	1,637,957	4,535,060	3,165,446	1,280,668	1,853,461	614,178	42,646	297,798	236,152	13,985,030
N-P	60	313	1,193	55,216	220,836	11,190	51,743	49,367	111,792	2,247	503,957
P-K	24,304	111,030	218,250	177,499	61,080	207,726	46,664	93	4,162	6,304	857,112
N-K	0	168	263,957	460	3	5,754	1,495	0	4,172	27,514	303,523
CHEMICAL NITROGEN MATERIALS	**12,154**	**85,672**	**828,021**	**494,779**	**718,623**	**615,164**	**515,893**	**246,440**	**951,398**	**76,502**	**4,544,646**
Ammonia, anhydrous	0	3,016	25,878	79,904	170,805	71,570	165,603	48,079	143,440	594	708,889
Ammonia, aqua	0	0	948	6,818	17,204	4,225	8,297	23,520	323,989	41,970	426,971
Ammonium nitrate[2]	5,198	31,702	157,038	154,954	311,675	283,683	127,371	79,228	79,883	562	1,231,294
Ammonium nitrate-limestone mixtures	46	1,520	218,744	1,927	67	37,070	3,503	1,053	69	0	263,999
Ammonium sulfate	252	11,479	5,784	98,509	10,223	14,385	80,062	44,799	244,594	24,708	534,795
Calcium cyanamide	625	6,178	8,380	675	150	9,083	8,003	2,758	6,410	4	42,266
Calcium nitrate	0	9	9,464	50	0	579	0	10,005	29,040	581	49,728
Nitrogen solutions	1,795	7,396	170,810	112,603	199,814	28,152	36,170	14,452	79,067	0	650,259
Sodium nitrate	1,605	11,702	223,951	1,870	424	159,070	54,651	561	377	130	454,341
Urea	1,248	6,179	4,490	26,819	5,497	4,004	30,976	19,127	37,656	6,202	142,198
Other	1,385	6,491	2,534	10,650	2,764	3,343	1,257	2,858	6,873	1,751	39,906
NATURAL ORGANIC MATERIALS	**16,815**	**36,681**	**31,239**	**41,271**	**18,335**	**2,555**	**7,152**	**7,754**	**329,530**	**132**	**491,464**
Blood, dried	3	31	57	0	3	0	0	22	2,070	0	2,186
Castor pomace	686	293	3,302	0	0	0	0	0	3,510	0	7,791
Compost	1	3,639	92	4,586	8,728	30	2,528	824	0	0	20,428
Cottonseed meal[3]	1,889	108	1,800	0	0	9	0	2	6	0	3,814
Fish scrap, meal, emulsions	330	66	1	0	0	0	0	0	1,324	0	1,721
Manures, dried	4,694	11,234	6,030	7,838	3,417	1,037	2,780	1,745	[4]273,449	0	312,224
Sewage sludge, activated	6,871	15,543	10,474	26,448	6,029	1,285	1,844	3,710	17,281	95	89,580
Sewage sludge, other	0	0	52	1,754	126	12	0	900	29,922	12	32,778
Tankage, all	2,068	5,367	3,509	645	30	182	0	77	827	25	12,730
Other	273	400	5,922	0	2	0	0	474	1,141	0	8,212
PHOSPHATE MATERIALS	**31,975**	**81,933**	**87,917**	**642,374**	**517,040**	**193,800**	**247,343**	**211,091**	**311,532**	**14,224**	**2,339,229**
Ammonium phosphate: 11-48[5]	1	2,463	110	17,370	52,169	2	4,733	15,602	22,537	1,396	116,383
Ammonium phosphate: 13-39[5]	0	3	0	97	22,705	17	18,344	4,212	5,808	0	51,186
Ammonium phosphate sulfate: 16-20[5]	0	0	0	1,212	101,028	96	97,159	60,780	117,499	561	378,335
Ammonium phosphate nitrate: 27-14[5]	0	0	69	125	7,397	3,297	0	5,945	7,945	0	24,778
Basic slag	0	0	12,172	0	0	57,911	2,593	0	0	0	72,676
Bonemeal: raw and steamed	1,175	3,055	1,907	1,253	237	353	202	36	1,788	207	10,213
Calcium metaphosphate	2	459	1,368	4,849	12,178	11,231	249	184	51	0	30,571
Diammonium phosphate: 21-53[5]	3	110	661	4,528	7,173	2,972	1,107	10,382	3,108	837	30,881
Phosphoric acid	0	35	0	351	57	0	4,674	12,486	14,559	0	32,162
Phosphate rock	466	7,303	24,342	470,510	123,095	11,855	20,338	40	429	3,208	661,586
Colloidal phosphate	0	393	1,319	780	1,240	4,982	3,095	50	80	0	11,939
Superphosphate: 18%	1,061	6,117	15,183	5,733	9,180	19,474	0	0	2,171	479	59,398
Superphosphate: 19%	5,251	206	1,543	3,274	13	89	0	3,441	7,284	0	21,101
Superphosphate: 20-22%	23,745	58,858	26,455	44,834	32,432	68,731	50,257	17,443	103,083	474	426,312
Superphosphate: 23-44%	0	0	76	2,322	889	2,745	595	0	764	5,038	12,429
Superphosphate: 45%	6	1,164	153	19,314	41,891	4,266	4,614	64,130	19,892	9	155,439
Superphosphate: 46%	61	1,757	1,496	57,382	101,876	4,780	39,230	15,066	1,255	1,496	224,399
Superphosphate: 47-54%	2	10	139	4,681	3,480	999	134	1,294	41	0	10,780
Other	202	0	924	3,759	0	0	19	0	3,238	519	8,661
POTASH MATERIALS	**2,041**	**9,433**	**76,608**	**201,760**	**49,605**	**66,265**	**40,418**	**2,297**	**15,909**	**9,989**	**474,325**
Lime-potash mixtures[6]	0	47	18,211	0	0	6,475	0	0	0	0	24,733
Manure salts	0	0	283	0	6	0	1,221	0	0	0	1,510
Potassium chloride: 50-60%	1,141	6,169	33,590	195,612	46,367	50,601	38,007	715	8,545	8,622	389,369
Potassium-magnesium sulfate	35	1,338	2,891	2,907	266	1,399	69	461	790	105	10,261
Potassium nitrate	99	13	125	6	0	0	0	0	0	0	243
Potassium sodium nitrate[7]	0	217	15,436	235	0	1,663	991	0	0	0	18,542
Potassium sulfate	191	1,589	4,289	2,948	2,921	6,127	130	1,121	6,423	1,059	26,798
Other	575	60	1,783	52	45	0	0	0	151	203	2,869
SECONDARY AND TRACE NUTRIENT MATERIALS	**449**	**5,812**	**108,072**	**5,460**	**1,268**	**4,758**	**3,499**	**28,691**	**1,216,927**	**3,193**	**1,378,129**
Aluminum sulfate[3]	0	8	15	30	1	0	0	0	79	0	133
Borax[3]	103	173	480	485	67	380	7	2	624	0	2,321
Calcium sulfate (gypsum)	311	1,034	104,581	1,311	945	4,227	1,175	20,988	1,162,383	0	1,296,955
Copper sulfate[3]	0	4,077	302	42	4	0	0	9	154	0	4,588
Iron sulfate[3]	0	10	195	5	0	0	3	234	2,886	2,843	6,176
Magnesium sulfate[3]	22	265	243	258	32	15	1	19	149	224	1,228
Manganese sulfate[3]	8	139	436	190	5	0	0	9	49	0	836
Mixed minerals[3]	1	25	721	1,057	132	1	84	725	3,724	0	6,470
Sulfur: 25-99% S	4	16	632	14	21	7	971	1,638	28,410	0	31,713
Sulfuric acid: 40-93%	0	0	0	0	0	0	1,258	1,571	1,203	0	4,032
Zinc sulfate[3]	0	8	467	58	61	128	0	63	3,180	115	4,080
Other	0	57	0	2,010	0	0	0	3,433	14,086	11	19,597
GRAND TOTAL	**409,462**	**1,968,999**	**6,150,317**	**4,784,265**	**2,867,458**	**2,960,673**	**1,528,385**	**588,379**	**3,243,220**	**376,257**	**24,877,415**

[1] Incldues the following fertilizers distributed by Government agencies for test demonstrations: — in mixtures, 11-33-0 grade 108 tons, 15-15-15 grade 172 tons, 30-10-0 grade 3,838 tons; in materials, calcium metaphosphate 4,231 tons, diammonium phosphate (21-53-0, 20-52-0) 3,789 tons, nitrogen solutions (30%) 2 tons, and superphosphate (54%) 618 tons. Excludes liming materials and the quantities of materials used in the manufacture of commercial mixtures. [2] Undetermined quantities may have been used for non-fertilizer purposes. [3] Distributed by manufacturers of fertilizers. [4] Includes an estimate of 270,000 tons consumed in California. [5] Includes all reported quantities of the grade. [6] Additional quantities are given free to farmers for which no records are kept. [7] Additional quantities may have been reported by grade under mixtures.

Table 2.—Fertilizer consumed as mixtures and as direct-application materials, by State and region, year ended June 30, 1960, and comparison with preceding year

State and region	Mixtures			Materials[1]			Grand total	Comparison with total consumption in year ended June 30, 1959	
	July 1 Dec. 31, 1959	Jan. 1-June 30, 1960	Total	July 1 Dec. 31, 1959	Jan. 1-June 30, 1960	Total		Fertilizer[2]	N, avail. P_2O_5, and K_2O
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Percent	Percent
Maine	13,735	138,381	152,116	2,551	5,686	8,237	160,353	89	90
New Hampshire	2,564	11,613	14,177	1,249	2,851	4,100	18,277	87	88
Vermont	5,945	35,215	41,160	14,005	3,951	17,956	59,116	107	108
Massachusetts	13,571	54,550	68,121	4,043	11,103	15,146	83,267	92	95
Rhode Island	1,596	13,108	14,704	452	1,276	1,728	16,432	98	98
Connecticut	9,216	46,534	55,750	4,883	11,384	16,267	72,017	91	96
New England	**46,627**	**299,401**	**346,028**	**27,183**	**36,251**	**63,434**	**409,462**	**93**	**94**
New York	122,206	394,950	517,156	24,510	50,629	75,139	592,295	95	98
New Jersey	46,759	167,108	213,867	7,495	15,779	23,274	237,141	93	92
Pennsylvania	173,903	412,465	586,368	24,570	57,309	81,879	668,247	100	101
Delaware	14,392	71,612	86,004	879	4,070	4,949	90,953	95	96
District of Columbia	1,591	2,492	4,083	830	500	1,330	5,413	110	105
Maryland	63,489	214,682	278,171	5,753	15,638	21,391	299,562	96	98
West Virginia	12,154	51,665	63,819	3,307	8,262	11,569	75,388	99	100
Middle Atlantic	**434,494**	**1,314,974**	**1,749,468**	**67,344**	**152,187**	**219,531**	**1,968,999**	**97**	**98**
Virginia	128,154	518,360	646,514	18,465	84,655	103,120	749,634	94	96
North Carolina	154,665	1,129,864	1,284,529	35,549	282,835	318,384	1,602,913	92	91
South Carolina	77,605	500,800	578,405	27,261	178,277	205,538	783,943	88	90
Georgia	198,097	931,254	1,129,351	52,695	273,207	325,902	1,455,253	99	100
Florida	528,912	850,749	1,379,661	56,790	122,123	178,913	1,558,574	106	106
South Atlantic	**1,087,433**	**3,931,027**	**5,018,460**	**190,760**	**941,097**	**1,131,857**	**6,150,317**	**96**	**97**
Ohio	267,071	698,077	965,148	25,351	96,249	121,600	1,086,748	99	102
Indiana	265,146	612,750	877,896	61,701	212,653	274,354	1,152,250	98	100
Illinois	170,475	428,844	599,319	414,425	438,400	852,825	1,452,144	91	93
Michigan	225,424	360,863	586,287	21,988	62,196	84,184	670,471	91	93
Wisconsin	55,512	314,459	369,971	10,827	41,854	52,681	422,652	88	91
East North Central	**983,628**	**2,414,993**	**3,398,621**	**534,292**	**851,352**	**1,385,644**	**4,784,265**	**94**	**97**
Minnesota	84,427	308,735	393,162	38,243	107,045	145,288	538,450	98	97
Iowa	63,160	376,793	439,953	66,529	184,210	250,739	690,692	99	102
Missouri	168,565	335,362	503,927	109,467	188,952	298,419	802,346	86	99
North Dakota	13,767	36,185	49,952	29,418	64,607	94,025	143,977	109	111
South Dakota	1,983	10,543	12,526	5,732	17,840	23,572	36,098	93	96
Nebraska	9,508	40,167	49,675	67,600	204,659	272,259	321,934	106	104
Kansas	69,349	44,043	113,392	114,551	106,018	220,569	333,961	115	119
West North Central	**410,759**	**1,151,828**	**1,562,587**	**431,540**	**873,331**	**1,304,871**	**2,867,458**	**97**	**103**
Kentucky	76,637	385,363	462,000	30,642	76,745	107,387	569,387	95	98
Tennessee	95,763	394,868	490,631	32,692	100,716	133,408	624,039	104	106
Alabama	138,375	665,592	803,967	48,643	221,123	269,766	1,073,733	100	113
Mississippi	27,928	293,605	321,533	118,132	253,849	371,981	693,514	99	105
East South Central	**338,703**	**1,739,428**	**2,078,131**	**230,109**	**652,433**	**882,542**	**2,960,673**	**99**	**106**
Arkansas	20,207	153,563	173,770	38,655	152,178	190,833	364,603	101	104
Louisiana	36,764	127,773	164,537	33,648	111,363	145,011	309,548	106	109
Oklahoma	33,862	43,828	77,690	38,827	28,826	67,653	145,343	109	116
Texas	85,549	212,534	298,083	148,193	262,615	410,808	708,891	107	111
West South Central	**176,382**	**537,698**	**714,080**	**259,323**	**554,982**	**814,305**	**1,528,385**	**105**	**109**
Montana	486	3,512	3,998	13,653	27,077	40,730	44,728	109	111
Idaho	3,748	15,325	19,073	28,589	101,851	130,440	149,513	109	118
Wyoming	293	832	1,125	2,293	14,761	17,054	18,179	115	117
Colorado	3,864	15,069	18,933	21,670	55,657	77,327	96,260	111	115
New Mexico	750	3,261	4,011	8,172	33,971	42,143	46,154	112	116
Arizona	10,558	24,286	34,844	52,391	98,371	150,762	185,606	96	98
Utah	1,719	6,381	8,100	4,728	29,526	34,254	42,354	115	110
Nevada	629	1,393	2,022	1,108	2,455	3,563	5,585	96	107
Mountain	**22,047**	**70,059**	**92,106**	**132,604**	**363,669**	**496,273**	**588,379**	**105**	**109**
Washington	11,611	39,829	51,440	80,898	144,148	225,046	276,486	114	114
Oregon	7,000	22,550	29,550	41,503	127,640	169,143	198,693	99	100
California	107,382	229,552	336,934	1,163,365	1,267,742	2,431,107	2,768,041	101	104
Pacific	**125,993**	**291,931**	**417,924**	**1,285,766**	**1,539,530**	**2,825,296**	**3,243,220**	**102**	**105**
48 States and D. C.	**3,626,066**	**11,751,339**	**15,377,405**	**3,158,921**	**5,964,832**	**9,123,753**	**24,501,158**	**98**	**101**
Alaska	0	1,850	1,850	0	2,469	2,469	4,319	---	---
Hawaii	32,131	25,775	57,906	35,034	34,315	69,349	127,255	92	96
Puerto Rico	91,945	120,516	212,461	14,711	17,511	32,222	244,683	95	95
United States 1959-60	**3,750,142**	**11,899,480**	**15,649,622**	**3,208,666**	**6,019,127**	**9,227,793**	**24,877,415**	**98**	**101**
1958-59	**3,794,680**	**12,274,347**	**16,069,027**	**[3]3,276,656**	**[4]5,962,557**	**9,239,213**	**25,308,240**	**100**	**100**
1957-58	**3,420,837**	**10,932,186**	**14,353,023**	**2,294,676**	**5,168,064**	**8,162,740**	**22,515,763**	**90**	**88**

[1] Includes the primary nutrient (N, P_2O_5, K_2O) and the secondary and trace nutrient materials. [2] Guaranteed to contain one or more of the primary nutrients. [3] Revised: 8 tons was subtracted from the South Carolina total. [4] Revised: 4,424 tons was subtracted from the South Carolina total.

terials in Hawaii.

Although the national consumption of primary nutrient fertilizers in 1959-60 was lower than in 1958-59, the change in consumption was not highly significant and the level of fertilizer use resulted in the second highest year in the history of the United States.

Mixtures

In 1959-60 mixtures comprised 62.9 percent of the tonnage of fertilizers consumed and amounted to 15,649,622 tons. This quantity, exclusive of 1,850 tons used in Alaska for which there is no comparison, was but 421,255 tons (2.6 percent) below consumption in the preceding year. There were 1,870 grades reported. In addition over 500 grades, not reported by grade but many of which undoubtedly were duplicated in the above total, were used in California. An unknown number for which the grade was not shown were also reported as miscellaneous tonnage in other States. These are principally custom mixtures prepared by manufacturers.

The tonnages of mixtures consumed in most of the States east of the Mississipi River in 1959-60 were below their respective tonnages in 1958-59, whereas, consumption in most of the States to the west was above that in the preceding year. Decreases in States east of the Mississippi River ranged from one percent (Ohio) to 14 percent (New Hampshire), those to the west increased from one percent (Iowa) to 42 percent (New Mexico). Total consumption in the east decreased 470,093 tons (3.6 percent), and increased in the west 57,105 tons (2.1 percent).

Mixtures consumed are principally of the type containing all three primary nutrients (table 1). In 1959-60, this type represented 89.4 percent of the tonnage of mixtures, while the other types (N-P, P-K, N-K) accounted for 3.2 percent, 5.5 percent, and 1.9 percent, respectively. The number of grades reported as type N-P-K were 1,316 (70.4 percent), N-P, 190 (10-2 percent), P-K, 169 (9.0 percent), and N-K, 195 (10.4 percent). The N-P-K mixtures comprised more than 80 percent of the tonnage of mixtures in all regions except the Mountain and Pacific. In these regions, N-P-K mixtures represented 46.3 and 71.3 percent and the N-P type represented 53.6 and 26.8 percent, respectively. The proportion of the N-P class does not include the ammoniated phosphate grades, 11-48-0, 13-39,0, 16-20-0, 27-14-0, and 21-53-0. These are classed as materials in this publication, however, all of the other N-P grades, including 16-48-0, 18-46-0, and 24-20-0 are contained in this class.

Table 3.—Change in consumption of fertilizer mixtures and direct-application materials, by region, year ended June 30, 1960, compared with preceding year

Region	Increase or Decrease (—)					
	Mixtures	Materials[1]	Total	Mixtures	Materials[1]	Total
	Tons	Tons	Tons	Percent	Percent	Percent
New England	— 27,591	—5,378	—32,969	—7.4	—7.9	—7.5
Middle Atlantic	— 66,419	1,083	—65,336	—3.7	.5	—3.2
South Atlantic	—141,736	—77,611	—219,347	—2.7	—7.0	—3.5
East North Central	—233,874	—71,019	—304,893	—6.4	—4.9	—6.0
West North Central	9,979	—86,607	—76,628	.6	—6.2	—2.6
East South Central	— 473	—16.752	—17,225	[2]	—1.9	— .6
West South Central	22,764	56,114	78,878	3.3	7.4	5.4
Mountain	18,582	10,115	28,697	25.3	2.2	5.4
Pacific	5,780	36,945	42,725	1.4	2.4	2.2
Total	**—412,988**	**—153,110**	**—566,098**	**—2.6**	**—1.9**	**—2.4**
Alaska[3]	---	---	---	---	---	---
Hawaii	3,409	—14,483	—11,074	6.3	—18.0	—8.2
Puerto Rico	—11,676	—1,210	—12,886	—5.2	—3.6	—5.0
United States	**—421,255**	**—168,803**	**—590,058**	**—2.6**	**—2.1**	**—2.4**

[1] Excludes quantities of secondary and trace nutrient materials for direct application. [2] Less than 0.05 percent. [3] Consumption in 1958-59 not available for comparisons.

Grades consumed in the United States, excluding Alaska, Hawaii, and Puerto Rico, in quantities of 10,000 tons or more each, numbered 127. Only 126 of these are listed in table 4 as one grade was marked by less than three producers. The 127 grades totaled 14,092,083 tons and accounted for 91.64 percent of the quantity of mixtures used in the 48 States and District of Columbia. Other grades consumed in amounts of 2,500 to 9,999 tons totaled 116 (604,094 tons, 3.93 percent), whereas those under 2,500 tons totaled 1,585 (407,044 tons, 2.65 percent). The balance (274,184 tons, 1.78 percent) represented mixtures not reported by grades. Compared with 1958-59, there were nine more grades listed in the 10,000 tons or more category but the total consumption of this class was lower by 378,403 tons (2.6 percent), although the proportion to all mixtures consumed was the same in both years; in the 2,500 to 9,999 tons category there was little change but in the less than 2,500 ton category, 205 more grades were recorded and the total of this class increased 56,540 tons (16.1 percent).

Consumption of mixtures in Alaska, Hawaii, and Puerto Rico amounted to 148,141 tons in 201 listed grades. A total of 1,850 tons was recorded for Alaska with principal grades listed as 8-32-16, 10-20-10, and 10-20-20. Many of the grades in Puerto Rico are similar to those consumed in other areas of the United States. In Hawaii, however, most grades are designated in fractional numbers.

The 15 grades consumed in largest tonnages in 1959-60 in each of the regions are shown in table 5 together with the quantities for each State in the region. At least 10 of the grades in each area were among the 15 consumed in largest tonnages in the preceding year, but not always in the same order of tonnage. In most cases, shifts in the order of grades resulted from increased use of grades of higher nitrogen or higher total primary nutrient content. The listed grades accounted for 50 percent or more of the total quantity of mixtures consumed in each of the States except California, Colorado, Florida, Nebraska, Nevada, North Dakota, Oregon, South Dakota, and Washington. In these States, they represented 14 to 45 percent of the total. In California and Florida over 500 and 1,000 grades, respectively, are used annually whereas in the other States N-P grades dominate the tonnage, a large proportion of which are of those grades classed in this publication as materials.

The total tonnage of the 15 grades listed for the United States, excluding Alaska, Hawaii, and Puerto Rico, represented 57.4 percent of the tonnage of all mixtures. As in the preceding year, the 5-10-10, 4-12-12, 5-20-20, 12-12-12, and 10-10-10 grades were consumed in largest tonnage, in descending order. The totals of the first three grades during each of the past 3 years have accounted for 24 percent of the tonnage of all mixtures consumed. Except for grade 4-10-7, which was replaced by grade 6-24-12, the other nine grades were the same as in 1958-59 but in general their relative tonnages differed

somewhat.

Approximately 90 percent of the tonnage of mixtures reported by grade in the United States (excluding Alaska, Hawaii, and Puerto Rico) were represented by 37 primary-nutrient ratios (table 6). Ratios 1:2:2,, 1:1:1, 1:4:4, and 1:3:3 accounted for the largest tonnage, in descending order and their cumulative total amounted to 54 percent of the tonnage. Compared with 1958-59, these 37 ratios are with one exception the same, however, their order of tonnage changed somewhat. Ratio 2:4:5 listed in 1958-59 and consumed in amount of 87,089 tons dropped to 17,614 tons. Ratio 0:2:1 was added to the 1959-60 list. In 1958-59, these ratios also represented about the same proportion of the total tonnage.

The national average primary nutrient content of mixtures in 1959-60 was 6.50 percent of N, 12.99 percent of available P_2O_5, and 12.06 percent of K_2O, a total of 31.55 percent (table 7.) Compared with the corresponding averages in 1958-59, the increase was highest for N (4.50 percent), while that for available P_2O_5 was 3.59 percent, and for K_2O only 1.26 percent. These percentages reflect the continued trend toward increased concentration of primary nutrients in mixtures used throughout the United States. The high rate for nitrogen resulted from substantial increases in average nitrogen contents in 46 areas and decreases in only 5. The average rate of increase was highest in the West North Central region (7.14 percent) and lowest in the Pacific region (1.74 percent). The average rate of increase was substantially higher for available P_2O_5 than in any previous year since 1949-50. The mean rate of increase for the 10-year period prior to 1959-60 was 1.53 percent. Although increases were recorded in 36 areas and decreases in 15 in 1959-60 compared with 1958-59, the rates of increases were above the national average (3.59 percent) in the Mountain (19.83 percent), East South Central (12.10 percent), Pacific (10.15 percent) West North Central (6.31 percent), and West South Central (5.64 percent) regions. For the 18 areas comprising the regions along the Atlantic coast, the average available P_2O_5 content was lower in 11 in 1959-60 than in the preceding year. The average K_2O contents increased in 35 areas and decreased in 16. In 1959-60, the national average rate of increase was the lowest in any year over the preceding 10-year period and has shown a tendency to drop each annual period. In the West North Cen-

Table 4.—Grades of fertilizer mixtures consumed, United States, years ended June 30, 1959 and 1960[1]

Grade[2]	Consumption		Proportion of total		Grade[2]	Consumption		Proportion of total	
	1959	1960	1959	1960		1959	1960	1959	1960
	Tons	Tons	Percent	Percent		Tons	Tons	Percent	Percent
0-9-27	13,689	16,059	0.09	0.10	6-10-4	103,127	55,057	.65	.36
0-10-20	90,580	98,620	.58	.64	6-12-6	61,793	87,747	.40	.57
0-10-30	53,515	41,288	.33	.27	6-12-12	482,902	495,611	3.05	3.22
0-12-12	13,640	11,772	.09	.08	6-12-18	10,955	11,209	.07	.07
0-12-36	13,762	13,124	.09	.08	6-18-6	37,889	44,911	.24	.30
0-14-14	200,918	164,768	1.27	1.07	6-24-12	224,460	272,433	1.42	1.77
0-15-30	30,256	35,359	.19	.23	6-24-24	172,492	242,320	1.10	1.57
0-15-45	12,157	11,674	.08	.08	7-7-7	17,629	13,240	.11	.09
0-16-8	13,073	28,742	.08	.19	7-28-14	47,309	72,100	.30	.47
0-20-10	10,975	14,090	.07	.09	8-0-8	15,459	15,263	.10	.10
0-20-20	281,857	261,655	1.79	1.70	8-0-24	25,385	25,936	.16	.17
0-24-24	15,438	18,775	.09	.12	8-2-8	9,538	36,285	.06	.23
0-25-25	37,877	37,691	.24	.25	8-4-8	56,511	58,772	.35	.38
0-30-15	13,510	10,360	.09	.06	8-6-4	9,635	10,444	.06	.07
0-30-30	13,488	11,343	.08	.08	8-8-8	217,294	218,455	1.38	1.42
2-12-12	302,501	252,592	1.92	1.64	8-12-12	76,165	68,180	.48	.45
3-9-6	37,654	26,602	.24	.17	8-16-16	200,023	192,531	1.27	1.25
3-9-9	466,021	463,157	2.95	3.01	8-24-0	26,665	57,039	.17	.37
3-9-12	49,747	58,233	.32	.38	8-24-8	56,837	56,536	.36	.37
3-9-13	16,426	29,338	.10	.19	8-24-12	36,617	34,466	.23	.22
3-9-18	84,886	83,811	.54	.55	8-32-0	61,897	46,759	.39	.30
3-9-27	61,732	53,355	.39	.35	8-32-16	19,864	33,443	.13	.22
3-12-6	71,452	53,636	.45	.34	9-9-9	35,875	27,861	.23	.18
3-12-12	626,227	471,000	3.97	3.07	9-12-12	17,278	18,854	.11	.13
3-18-18	18,124	16,360	.12	.10	9-36-0	10,175	10,315	.06	.06
4-6-8	29,859	24,934	.18	.17	10-0-10	17,714	27,010	.12	.18
4-7-5	91,709	88,018	.59	.57	10-4-10	5,729	12,067	.04	.08
4-8-4	12,328	10,441	.07	.07	10-5-5	11,502	12,843	.07	.08
4-8-6	62,804	50,026	.40	.32	10-6-4	91,320	94,024	.58	.61
4-8-8	96,380	91,083	.61	.59	10-10-5	22,542	34,044	.14	.22
4-8-10	83,634	17,321	.53	.12	10-10-10	747,746	706,277	4.74	4.59
4-8-12	155,926	217,380	.99	1.41	10-20-0	47,847	44,486	.30	.29
4-8-16	8,735	12,729	.06	.08	10-20-5	15,751	18,745	.10	.12
4-9-3	59,968	54,124	.38	.36	10-20-10	218,214	234,117	1.39	1.53
4-10-6	120,548	72,766	.76	.47	10-20-20	56,902	63,549	.36	.41
4-10-7	305,838	244,714	1.94	1.59	10-30-10	7,842	11,426	.05	.07
4-10-10	22,838	27,525	.14	.18	12-0-10	13,505	18,144	.09	.12
4-11-11	10,908	12,600	.07	.08	12-0-12	15,884	15,837	.10	.10
4-12-4	33,262	20,548	.21	.13	12-6-6	29,395	33,281	.19	.22
4-12-8	112,909	104,633	.72	.68	12-12-12	900,038	882,726	5.70	5.74
4-12-12	1,240,135	1,165,698	7.85	7.59	12-24-12	36,595	42,881	.23	.28
4-12-36	9,118	11,224	.06	.07	13-13-13	51,419	71,792	.32	.47
4-16-8	28,554	28,232	.18	.18	14-0-7	2	11,177	[3]	.07
4-16-16	448,563	371,926	2.84	2.42	14-0-14	66,071	57,217	.42	.37
5-6-8	11,048	11,102	.07	.07	14-7-7	8,832	10,461	.05	.07
5-7-5	16,466	16,940	.11	.11	14-14-14	50,762	58,256	.32	.38
5-10-5	449,700	320,065	2.85	2.08	15-0-15	18,622	23,581	.12	.15
5-10-10	1,642,700	1,567,900	10.40	10.20	15-5-5	13,480	15,719	.09	.10
5-10-15	345,094	397,461	2.18	2.59	15-8-4	8,525	11,578	.05	.08
5-10-30	15,087	19,210	.10	.12	15-10-10	41,531	64,852	.26	.42
5-15-8	7,945	10,681	.05	.07	15-15-0	25,339	24,452	.16	.16
5-20-10	112,603	109,611	.72	.71	15-15-15	36,055	45,122	.23	.29
5-20-20	983,847	951,858	6.23	6.19	16-8-8	39,526	70,200	.25	.46
6-4-6	24,202	32,703	.15	.22	16-16-8	8,676	11,059	.05	.07
6-4-8	64,062	74,055	.40	.48	16-48-0	28,824	53,959	.18	.35
6-6-6	89,854	100,773	.57	.65	17-7-0	12,583	10,773	.08	.07
6-6-8	32,792	19,284	.21	.13	18-36-0	9,299	11,875	.06	.08
6-6-12	30,197	31,312	.19	.20	18-46-0	644	20,388	[3]	.13
6-6-18	14,210	14,533	.09	.10	20-0-20	15,124	11,122	.10	.07
6-8-6	105,287	103,426	.67	.67	20-20-0	9,634	17,124	.06	.12
6-8-8	252,026	244,798	1.60	1.59	23-23-0	8,001	12,910	.05	.08
6-8-12	20,870	16,854	.13	.11	24-20-0	12,237	13,822	.08	.09
6-9-12	11,581	13,674	.07	.09	30-10-0	10,620	13,601	.06	.09
Grades of 10,000 tons or more			[4]14,470,486		[5]14,092,083			91.64	91.64
Grades of 5,000 to 9,999 tons			[6] 350,461		[7] 361,395			2.22	2.35
Grades of 2,500 to 4,999 tons			[8] 242,264		[9] 242,699			1.53	1.58
Grades under 2,500 tons			[10] 350,504		[11] 407,044			2.22	2.65
Not reported by grade			376,678		274,184			2.39	1.78
Total			[12]15,790,393		[13]15,377,405			100.00	100.00

[1] Excludes Alaska, Hawaii, and Puerto Rico. [2] Consumed in amounts of 10,000 tons or more in year ended June 30, 1960. [3] Less than 0.005 percent. [4] 118 grades. [5] 127 grades. [6] 46 grades. [7] 48 grades. [8] 67 grades. [9] 68 grades. [10] 1,380 grades. [11] 1,585 grades. [12] 1,611 grades. [13] 1,828 grades.

Table 5.—Grades of fertilizer mixtures consumed, by region and State, year ended June 30, 1960

State	Consumption of 15 principal grades in indicated region (tons)															Other Grades		Total tons
																No.[1]	Tons[2]	
New England																		
	8-12-12	10-10-10	5-10-10	8-16-16	0-20-20	15-10-10	6-9-12	0-15-30	11-12-14	10-15-15	10-6-4	8-9-10	8-6-4	5-8-7	5-10-5			
Maine	60,499	25,306	5,197	13,116	232	1,673	12,285	1,127	8,744	6,667	161	6,845	179	1,401	292	33	8,392	152,116
New Hampshire	541	2,567	1,382	4,400	111	1,547	0	901	0	217	222	0	185	476	385	23	1,243	14,177
Vermont	325	8,882	3,271	7,398	11,481	3,827	0	4,097	0	112	22	0	60	16	112	26	1,557	41,160
Massachusetts	682	11,578	14,319	5,313	321	2,475	0	1,309	0	0	4,325	0	2,703	2,740	2,154	28	20,202	68,121
Rhode Island	1,549	1,479	5,392	437	66	208	0	240	0	100	189	0	1,911	382	321	26	2,430	14,704
Connecticut	740	11,793	6,797	2,503	620	2,848	0	3,031	0	502	2,488	0	1,239	1,040	2,441	68	19,708	55,750
Total	**64,336**	**61,605**	**36,358**	**33,167**	**12,831**	**12,578**	**12,285**	**10,705**	**8,744**	**7,598**	**7,407**	**6,845**	**6,277**	**6,055**	**5,705**	**92**	**53,532**	**346,028**
Middle Atlantic																		
	5-10-10	10-10-10	5-10-5	8-16-16	0-20-20	3-12-6	6-12-12	10-6-4	10-20-20	4-8-12	3-12-12	5-10-15	12-12-12	2-12-12	6-12-6			
New York	125,999	70,653	91,085	58,652	17,335	569	15,356	16,195	11,180	747	2,737	9,114	18,475	84	16,748	95	62,227	517,156
New Jersey	101,660	15,964	19,521	2,833	2,020	319	4,601	9,177	1,492	299	1,613	2,059	145	15	1,659	85	50,490	213,867
Pennsylvania	268,129	58,016	26,151	41,039	37,002	21,823	11,420	5,587	9,114	7,594	8,964	1,765	2,604	4,185	916	118	82,059	586,368
Delaware	35,703	11,842	1,260	4,428	1,900	109	2,589	305	720	541	1,370	7,958	18	2,967	0	74	14,294	86,004
Dist. of Columbia	143	16	2,360	0	0	0	0	876	0	4	0	0	0	18	0	18	666	4,083
Maryland	104,613	31,772	23,153	8,751	5,408	11,374	2,536	3,175	2,780	16,259	10,164	1,368	188	10,747	233	107	45,650	278,171
West Virginia	32,241	4,186	2,025	352	5,767	4,252	344	531	823	27	331	379	865	2,577	14	46	9,105	63,819
Total	**668,488**	**192,449**	**165,555**	**116,055**	**69,432**	**38,446**	**36,846**	**35,846**	**26,109**	**25,471**	**25,179**	**22,643**	**22,295**	**20,593**	**19,570**	**214**	**264,491**	**1,749,468**
South Atlantic																		
	4-12-12	5-10-10	3-9-9	5-10-15	2-12-12	4-8-12	10-10-10	6-6-6	8-8-8	4-8-8	4-7-5	0-10-20	6-8-6	6-4-8	4-10-6			
Virginia	989	203,421	52,931	4,503	110,708	5,856	49,871	0	7,319	0	0	35,576	17,171	0	3	44	158,166	646,514
North Carolina	6,679	445,561	321,491	1,671	110,234	102,213	20,981	0	40,488	0	0	12,984	33,817	0	0	40	188,410	1,284,529
South Carolina	162,740	55,067	43,373	4,026	0	73,498	6,597	0	6,336	0	0	6,679	6,525	0	72,715	46	140,849	578,405
Georgia	625,464	8,752	37,641	213,680	5,538	4,595	2,900	0	5,357	25,998	20	16,204	20,687	0	0	135	162,515	1,129,351
Florida	60,616	5,413	6,834	6,645	3,342	5,299	31,375	100,672	31,454	62,089	87,998	12,570	4,132	74,055	6	1,151	887,161	1,379,661
Total	**856,488**	**718,214**	**462,270**	**230,525**	**229,822**	**191,461**	**111,724**	**100,672**	**90,954**	**88,087**	**88,018**	**84,013**	**82,332**	**74,055**	**72,724**	**1,197**	**1,537,101**	**5,018,460**
East North Central																		
	5-20-20	12-12-12	4-16-16	3-12-12	6-24-12	10-10-10	6-24-24	5-10-10	0-20-20	7-28-14	16-8-8	3-9-27	0-10-30	10-6-4	5-20-10			
Ohio	132,324	152,431	43,326	188,583	106,834	33,792	0	90,570	20,913	1,265	21,663	490	398	13,118	8,859	148	150,582	965,148
Indiana	251,329	166,567	136,523	38,430	22,296	25,242	49,154	1,759	26,538	6,788	7,242	14,802	6,954	2,865	974	144	120,433	877,896
Illinois	66,115	71,655	69,583	22,409	13,476	62,775	31,472	46	20,441	49,975	16,925	13,105	3,007	3,894	4,742	144	149,699	599,319
Michigan	133,075	119,905	78,736	63,585	58,113	13,846	5,936	2,461	6,913	579	2,574	1,248	1,330	14,248	18,896	108	64,842	586,287
Wisconsin	108,760	9,383	27,859	22,435	4,157	28,452	46,840	181	17,292	2,042	1,147	16,223	25,672	586	440	86	58,502	369,971
Total	**691,603**	**519,941**	**356,027**	**335,442**	**204,876**	**164,107**	**133,402**	**95,017**	**92,097**	**60,649**	**49,551**	**45,868**	**37,361**	**34,711**	**33,911**	**291**	**544,058**	**3,398,621**
West North Central																		
	12-12-12	5-20-20	5-20-10	6-24-12	6-24-24	10-10-10	8-24-8	16-48-0	8-24-12	10-20-10	10-20-0	0-20-20	15-10-10	6-18-6	3-12-12			
Minnesota	10,101	84,718	6,001	55,858	28,374	9,586	28	2,314	32,115	776	1,634	8,412	0	5,743	403	176	147,099	393,162
Iowa	26,247	109,179	58,855	6,185	23,702	37,328	486	5,323	1,063	7,110	11,217	8,915	1,362	13,775	3,076	239	126,130	439,953
Missouri	215,983	17,509	1,459	3,176	14,080	9,926	31,732	923	0	8,341	0	5,818	17,869	760	17,139	34	159,212	503,927
North Dakota	435	292	85	1,099	26	91	0	4,925	904	42	0	19	0	0	0	50	42,034	49,952
South Dakota	68	19	1	105	17	90	0	318	86	98	764	0	0	230	0	61	10,730	12,526
Nebraska	1,632	489	1,401	88	96	59	476	4,134	0	1,911	3,772	521	0	1,765	0	145	33,331	49,675
Kansas	6,564	342	4	0	150	1,570	18,672	26,297	0	8,809	7,569	223	3,183	0	282	62	39,727	113,392
Total	**261,030**	**212,548**	**67,806**	**66,511**	**66,445**	**58,650**	**51,394**	**44,234**	**34,168**	**27,087**	**24,956**	**23,908**	**22,414**	**22,273**	**20,900**	**386**	**558,263**	**1,562,587**

Table 5.—Grades of fertilizer mixtures consumed, by region and State, year ended June 30, 1960

East South Central																		
	6-12-12	4-12-12	4-10-7	6-8-8	5-10-15	0-14-14	4-12-8	10-10-10	5-10-5	0-20-20	8-8-8	5-10-10	5-20-20	0-16-8	3-9-6			
Kentucky	39,851	2,021	0	0	103,970	40	83,944	55,433	2,336	8,538	418	13,237	29,751	0	7,549	164	114,912	462,000
Tennessee	337,616	1,380	274	1,193	28,850	390	4,408	9,769	3,416	8,663	713	9,962	532	32	18,671	117	64,762	490,631
Alabama	4,626	286,400	214,841	54,993	813	105,767	3	14,902	1,170	8,031	31,752	312	663	26,223	0	60	53,471	803,967
Mississippi	5,505	2,189	4,404	147,250	0	2,416	34	0	58,638	15,477	6,218	10,569	0	195	0	49	68,638	321,533
Total	**387,598**	**291,990**	**219,519**	**203,436**	**133,633**	**108,613**	**88,389**	**80,104**	**65,560**	**40,709**	**39,101**	**34,080**	**30,946**	**26,450**	**26,220**	**231**	**301,783**	**2,078,131**
West South Central																		
	10-20-10	6-12-6	8-8-8	12-12-12	12-24-12	6-24-24	13-13-13	10-20-0	0-20-20	3-12-12	0-24-24	6-8-12	5-20-20	5-10-10	5-10-5			
Arkansas	28,708	12,166	2,458	20,433	237	5,713	4,638	586	8,140	1,216	14,534	14,215	1,705	2,480	443	57	56,098	173,770
Louisiana	7,511	7,275	39,961	27,074	1,966	15,070	8,303	0	6,986	12,419	0	199	8,552	5,544	1,664	65	22,013	164,537
Oklahoma	36,361	6,836	196	733	2,730	1,096	452	8,761	412	548	0	3	909	829	503	55	17,321	77,690
Texas	110,590	32,520	11,279	4,480	20,796	1,972	6,273	7,757	249	552	9	4	1,992	3,554	8,765	162	87,291	298,083
Total	**183,170**	**58,797**	**53,894**	**52,720**	**25,729**	**23,851**	**19,666**	**17,104**	**15,787**	**14,735**	**14,543**	**14,421**	**13,158**	**12,407**	**11,375**	**216**	**182,723**	**714,080**
Mountain																		
	24-20-0	10-20-5	20-20-0	8-24-0	6-10-4	18-46-0	20-10-0	8-25-0	16-16-8	16-48-0	10-20-0	7-21-0	13-13-13	10-10-10	10-30-10			
Montana	569	0	1,326	307	275	0	721	0	177	30	40	0	24	0	123	20	406	3,998
Idaho	9,312	0	344	3,978	200	0	81	0	165	150	40	1,706	117	4	455	32	2,521	19,073
Wyoming	157	0	0	6	81	54	0	0	25	147	128	0	0	0	5	18	522	1,125
Colorado	0	0	204	0	531	1,572	124	764	277	987	164	0	109	23	622	115	13,556	18,933
New Mexico	0	179	104	263	166	654	19	0	210	173	11	0	610	57	9	27	1,556	4,011
Arizona	0	7,748	5,082	744	254	544	1,702	1,863	418	568	1,413	0	626	1,187	27	65	12,668	34,844
Utah	2,278	18	174	168	2,068	0	60	0	977	0	86	0	0	0	0	23	2,271	8,100
Nevada	0	0	109	0	476	0	77	6	190	0	0	0	5	44	0	23	1,115	2,022
Total	**12,316**	**7,945**	**7,343**	**5,466**	**4,051**	**2,824**	**2,784**	**2,633**	**2,439**	**2,055**	**1,882**	**1,706**	**1,491**	**1,315**	**1,241**	**209**	**34,615**	**92,106**
Pacific																		
	10-10-10	10-10-5	8-24-0	17-7-0	15-8-0	15-8-4	6-10-4	11-8-4	10-20-20	8-8-4	4-10-10	12-15-0	20-10-0	8-25-0	6-20-20			
Washington	432	483	7,819	0	0	0	2,559	0	4,663	0	0	0	4,888	0	1,885	85	28,711	51,440
Oregon	636	0	2,906	0	45	37	1,590	0	2,822	0	0	0	291	0	2,960	57	18,263	29,550
California	29,929	27,774	15,573	10,726	9,531	9,425	5,277	8,045	0	6,849	6,719	5,811	0	4,882	0	[3]26	196,393	336,934
Total	**30,997**	**28,257**	**26,298**	**10,726**	**9,576**	**9,462**	**9,426**	**8,045**	**7,485**	**6,849**	**6,719**	**5,811**	**5,179**	**4,882**	**4,845**	**125**	**243,387**	**417,924**
Other[4]																		
	14-4-10	15-4-7	12-6-8	14-2-8	12-6-10	10-10-8	10-6-20	8-6-10	6-8-10	13-3-12	12-4-10	12-6-16	9-10-5	12-3-16	16-4-5			
Puerto Rico	**69,086**	**16,144**	**12,873**	**12,539**	**12,510**	**10,269**	**10,142**	**9,616**	**8,058**	**6,733**	**6,045**	**5,991**	**4,829**	**4,761**	**3,756**	**16**	**19,106**	**212,461**
United States[5]																		
	5-10-10	4-12-12	5-20-20	12-12-12	10-10-10	6-12-12	3-12-12	3-9-9	5-10-15	4-16-16	5-10-5	6-24-12	0-20-20	2-12-12	6-8-8			
New England	36,358	0	0	1,003	61,605	1,583	3	0	2	6	5,705	0	12,831	0	2,557	97	224,375	346,028
Mid Atlantic	668,488	16,444	3,339	22,295	192,449	36,846	25,179	640	22,643	833	165,555	356	69,432	20,593	0	215	504,376	1,749,468
So. Atlantic	718,214	856,488	248	2,386	111,724	21,187	50,106	462,270	230,525	308	57,011	0	5,937	229,822	37,754	1,198	2,234,480	5,018,460
E. No. Cent.	95,017	589	691,603	519,941	164,107	31,187	335,442	126	10,388	356,027	10,186	204,876	92,097	0	19	292	887,016	3,398,621
W. No. Cent.	763	187	212,548	261,030	58,650	10,761	20,900	0	0	12,035	4,153	66,511	23,908	0	0	390	891,141	1,562,587
E. So. Cent.	34,080	291,990	30,946	22,521	80,104	387,598	24,635	121	133,633	2,702	65,560	346	40,709	2,177	203,436	231	757,573	2,078,131
W. So. Cent.	12,407	0	13,158	52,720	5,326	6,422	14,735	0	270	0	11,375	344	15,787	0	1,032	220	580,504	714,080
Mountain	6	0	0	384	1,315	27	0	0	0	15	306	0	70	0	0	217	89,983	92,106
Pacific	2,567	0	16	446	30,997	0	0	0	0	0	214	0	884	0	0	134	382,800	417,924
Total	**1,567,900**	**1,165,698**	**951,858**	**882,726**	**706,277**	**495,611**	**471,000**	**463,157**	**397,461**	**371,926**	**320,065**	**272,433**	**261,655**	**252,592**	**244,798**	**1,813**	**6,552,248**	**15,377,405**

[1] Excludes mixtures not reported by grade. [2] Includes tonnage of mixtures not reported by grade. [3] Total number of mixtures exceeds 500 of which only 38 were reported by grade. [4] Total consumption of mixtures in Alaska was 1,850 tons (principal grades; 10-20-10, 10-20-20, 8-32-16) and in Hawaii 57,906 tons, comprising 175 grades, most of which were manufactured to consumers' specifications. Consumption in other possessions was negligible. [5] Excludes Alaska, Hawaii, and Puerto Rico.

tral and Mountain region, the mean for these regions decreased 1.27 and 6.60 percent, respectively.

Primary Nutrient Materials

Consumption of primary-nutrient materials for direct application amounted to 7,849,664 tons and accounted for 31.6 percent of all fertilizers used in 1959-60. This quantity was 166,345 tons (2.1 percent) less than the revised amount (8,016,009 tons) consumed in 1958-59. The tonnages of the principal products used in each State in 1959-60 are shown in table 8. In most States, changes in the total consumption of direct-application materials closely corresponded to changes in the total consumption of mixtures.

Compared with 1958-59, decreases in consumption were largest in the phosphate class of materials followed by natural organics and potash, in the order named, while the total of the class of chemical nitrogen materials increased in 1959-60 (table 9). Th eincrease in tonnage of chemical nitrogen materials is reflected in the increase in nitrogen solutions (90,063 tons, 9.1 percent), urea (32,022 tons, 29.1 percent), and anhydrous ammonia (27,725 tons, 4.1 percent); while decreases were largest in ammonium nitrate-limestone mixtures (42,352 tons, 13.8 percent), ammonium nitrate (41,503 tons, 3.3 percent), and sodium nitrate (25,033 tons, 5.2 percent). The largest increase in this class was in the West South Central, followed by the East South Central and West North Central regions, in the order named; while the largest decrease was in the South Atlantic region. Nitrogen solutions have continued to show a high rate of increase in the South Atlantic region.

Consumption of the natural organic products decreased about five percent from the preceding year. Dried manures, activated sewage sludge, and tankage accounted for most of the decrease in this class.

The decrease in the phosphate class of products was largely accountable to the decreases recorded in the West North Central (114,770 tons, 18.2 percent), East North Central (57,034 tons, 8.2 percent), and East South Central (52,784 tons, 21.4 percent) regions. These decreases were only partly offset by increases in the Pacific, Mountain, West South Central, and New England regions. In these, increases ranged from 5 to 15 percent. The substantial decrease in use of phosphate rock in Illinois and Missouri accounted for most of the decrease in the East North Central and West North Central regions, while the lower consumption of basic slag in Alabama and Mississippi were accountable for most of the decrease in the East South Central region.

Table 6.—Principal primary-nutrient ratios of mixtures consumed, United States, year ended June 30, 1960[1]

Primary-nutrient ratio[2]	Consumption	Proportion of total
	Tons	Percent
1:1:2	2,415,159	15.99
1:1:1	2,132,804	14.12
1:4:4	2,037,233	13.49
1:3:3	1,641,802	10.87
1:2:1	713,663	4.72
1:2:3	627,462	4.16
1:4:2	569,455	3.77
0:1:1	511,569	3.38
3:4:4	272,480	1.81
1:6:6	268,971	1.78
4:10:7	244,990	1.62
1:0:1	154,502	1.02
0:1:2	145,572	.97
1:3:2	140,604	.93
1:3:1	139,636	.93
2:1:1	139,455	.93
1:3:0	116,308	.77
3:4:3	103,426	.68
5:3:2	96,128	.64
1:3:6	95,676	.63
0:1:3	92,304	.61
4:7:5	88,063	.59
2:3:3	85,340	.56
3:2:2	78,088	.52
3:2:4	74,055	.49
2:5:3	72,766	.48
2:1:2	71,913	.48
2:2:1	69,584	.46
1:1:0	67,419	.44
1:3:9	64,579	.43
1:4:0	62,958	.42
1:2:0	62,260	.41
1:3:4	61,121	.40
0:2:1	56,372	.38
3:5:2	55,145	.36
4:9:3	54,130	.36
2:4:3	50,238	.33
Sub-total	13,733,230	90.93
Other[3]	1,369,991	9.07
Total[4]	**15,103,221**	**100.00**

[1] Excludes Alaska, Hawaii, and Puerto Rico. [2] N: available P_2O_5: K_2O. Consumed in amounts of 50,000 tons or more. [3] All other ratios of mixtures reported by grade. [4] Excludes mixtures not reported by grade.

Included in the phosphate class of products are the ammoniated phosphate grades 11-48-0, 13-39-0, 16-20-0, 27-14-0, and 21-53-0. The consumption of these have been recorded in table 10 for each State where consumed and include all quantities of the grade reported as mixtures and as materials. As was mentioned before, all of the other N-P types as 16-48-0, 18-46-0, etc. are classed as mixtures in this publication and the tonnages of these individual grades and others of this type will be found in tables 4 and 5 when consumed in large enough quantities. The total consumption of grades 11-48-0, 16-20-0, 27-14-0, and 21-53-0 increased while that for 13-39-0 was only slightly lower in 1959-60 compared with preceding year. The variations in use were not too significant in individual areas where principally consumed.

The lower consumption of the class of potash products, although not significant, was mostly accountable to decreases in use of potassium chloride throughout most of the States and there were only negligible increases in consumption of most of the other potash salts.

The weighted average primary-nutrient contents of the direct-application materials used in each of the areas are shown in table 7. These averages were computed from the actual analysis and reported tonnages of the individual materials comprising the respective classes. In 1959-60, single-nutrient nitrogen materials averaged 35.37 percent N, phosphate materials 20.38 percent available P_2O_5, and potash materials 55.78 percent K_2O. Multiple-nutrient materials averaged 27.85 and all materials 32.01 percent total plant nutrients. The corresponding averages in 1958-59 were 34.86, 18.61, 55.89, 26.63 (revised), and 31.01 (revised) percent. The generally higher averages for 1959-60 reflect increased use of higher analysis products.

The averages for materials containing only N ranged from 17.35 percent (District of Columbia) to 54.01 percent (North Dakota). Processed tankage in the District of Columbia and anhydrous ammonia and ammonium nitrate in North Dakota represented the principal products consumed in this class in these areas.

The single-nutrient P_2O_5 materials ranged from 8.64 percent (Florida) to 49.72 percent (Nevada). The low average for Florida resulted from the use of a large tonnage of phosphate rock with an estimated available P_2O_5 content of three percent. The high average for Nevada resulted from use of calcium metaphosphate and superphosphates containing over 22 percent available P_2O_5 as the principal phosphorus sources.

The range for the K_2O class was 20.66 percent in Virginia resulting from use of a large tonnage of lime-potash mixtures (6 percent K_2O content) to 62.54 percent in Idaho where a high-grade potassium chloride product was the potash source.

The averages of the multiple-nutrient class of materials varied from 10.07 percent in the District of Columbia due to a large tonnage of activated sewage sludge to 59.43 percent in Wyoming due to a large amount of ammoniated phosphate

Table 7.—Average primary nutrient content of mixtures and direct-application materials consumed, by State and region, year ended June 30, 1960[1]

Percent

State and region	Mixtures[2]				Materials					Total in mixtures and materials
					Single nutrient[3]			Multiple nutrient[3]		
	N	Available P_2O_5	K_2O	Total	N	Available P_2O_5[4]	K_2O		Total	
Maine	8.37	11.98	12.53	32.88	30.98	20.28	54.38	11.06	22.68	32.36
New Hampshire	8.08	12.47	12.99	33.54	31.88	20.76	59.73	10.88	23.56	31.31
Vermont	5.71	14.71	16.57	36.99	34.58	19.80	61.66	12.07	21.67	32.34
Massachusetts	7.94	10.02	9.66	27.62	22.18	20.19	60.32	10.67	17.31	25.75
Rhode Island	6.64	9.95	10.11	26.70	22.37	19.23	58.88	10.12	16.40	25.62
Connecticut	8.08	10.68	10.80	29.56	26.91	22.37	55.82	14.83	21.27	27.72
New England	**7.84**	**11.64**	**12.08**	**31.56**	**27.22**	**20.37**	**58.40**	**12.40**	**20.63**	**29.88**
New York	6.92	12.27	10.78	29.97	29.86	21.11	49.27	10.14	23.97	29.21
New Jersey	6.18	10.64	10.42	27.24	25.84	18.12	54.23	12.77	23.12	26.84
Pennsylvania	5.77	12.51	11.42	29.70	28.82	18.84	53.98	18.05	23.77	29.46
Delaware	5.72	11.10	12.69	29.51	33.08	23.85	60.54	12.53	32.51	29.67
District of Columbia	6.71	9.62	5.80	22.13	17.35	20.50	60.70	10.07	11.05	19.42
Maryland	5.57	11.28	11.24	28.09	31.66	17.04	54.20	16.57	28.04	28.08
West Virginia	4.60	12.46	11.13	28.19	22.73	23.40	60.11	10.72	23.20	27.43
Middle Atlantic	**6.08**	**11.93**	**11.29**	**29.30**	**29.12**	**20.08**	**52.96**	**14.02**	**24.26**	**28.76**
Virginia	4.44	11.18	12.09	27.71	25.83	22.62	20.66	31.12	24.49	27.33
North Carolina	4.64	9.38	10.68	24.70	23.28	19.26	42.67	18.98	24.20	24.61
South Carolina	4.33	10.12	11.12	25.57	21.12	16.06	59.18	16.88	23.23	24.96
Georgia	4.51	10.69	12.35	27.55	28.27	14.73	57.40	21.78	28.45	27.73
Florida	6.35	6.32	9.25	21.92	26.19	8.64	37.04	16.63	20.87	21.80
South Atlantic	**5.02**	**9.15**	**10.90**	**25.07**	**24.92**	**14.25**	**41.05**	**17.77**	**24.66**	**25.00**
Ohio	6.61	15.41	13.30	35.32	34.18	22.86	57.26	25.66	32.44	35.00
Indiana	6.69	17.12	16.35	40.16	44.54	23.92	59.68	47.94	46.02	41.55
Illinois	7.67	17.01	14.03	38.71	35.27	8.93	60.79	34.22	21.56	28.64
Michigan	6.71	16.47	14.99	38.17	39.40	19.90	53.37	18.67	34.68	37.75
Wisconsin	4.79	16.84	21.18	42.81	43.11	35.22	58.78	19.56	42.98	42.82
East North Central	**6.64**	**16.47**	**15.37**	**38.48**	**38.86**	**10.99**	**59.72**	**28.67**	**28.94**	**35.72**
Minnesota	7.03	22.60	15.33	44.96	41.90	36.89	58.79	39.02	41.30	43.97
Iowa	7.64	19.45	12.71	39.80	44.05	37.65	60.77	41.05	43.14	41.01
Missouri	10.27	14.58	13.37	38.22	43.89	8.95	60.64	31.80	28.29	34.53
North Dakota	16.26	29.36	3.08	48.70	54.01	46.08	61.92	49.37	48.82	48.78
South Dakota	16.23	23.89	1.30	41.42	38.02	44.70	61.92	42.50	40.88	41.07
Nebraska	11.33	24.94	3.42	39.69	49.84	43.65	53.88	49.25	49.38	47.90
Kansas	12.48	26.70	5.97	45.15	39.17	44.82	59.77	39.33	40.12	41.83
West North Central	**9.15**	**19.72**	**12.40**	**41.27**	**44.88**	**27.07**	**60.05**	**43.02**	**40.70**	**41.01**
Kentucky	5.70	12.14	12.48	30.32	36.77	25.11	55.19	35.04	35.36	31.27
Tennessee	6.13	12.08	12.22	30.43	35.80	23.64	41.59	45.90	34.86	31.38
Alabama	3.94	11.56	10.95	26.45	26.66	14.92	58.70	34.16	26.01	26.34
Mississippi	6.26	10.63	9.81	26.70	37.24	16.85	58.75	38.73	33.75	30.48
East South Central	**5.21**	**11.67**	**11.42**	**28.30**	**33.30**	**19.07**	**52.46**	**40.88**	**31.77**	**29.32**
Arkansas	7.17	16.12	15.44	38.73	38.22	35.70	59.84	34.16	41.63	40.25
Louisiana	7.54	13.94	12.45	33.93	39.92	16.49	59.93	33.50	37.44	35.37
Oklahoma	9.67	20.22	7.85	37.74	40.28	30.04	58.75	41.35	36.77	37.29
Texas	9.63	18.46	8.51	36.60	52.78	27.11	43.98	37.84	45.00	41.46
West South Central	**8.56**	**17.04**	**11.03**	**36.63**	**45.49**	**27.36**	**58.85**	**38.29**	**42.18**	**39.58**
Montana	17.46	20.24	2.33	40.03	40.47	47.51	62.10	46.52	45.54	45.04
Idaho	20.45	25.53	1.30	47.28	32.06	46.74	62.54	40.78	37.54	38.89
Wyoming	16.18	26.31	1.16	43.65	39.03	46.56	42.22	59.43	45.79	45.65
Colorado	13.85	24.42	6.32	44.59	42.63	43.99	45.82	56.39	44.98	44.90
New Mexico	12.77	22.07	4.83	39.67	48.30	34.45	45.63	40.60	41.47	41.31
Arizona	12.85	19.69	4.20	36.74	42.69	37.08	51.39	39.03	41.13	40.24
Utah	14.49	15.90	2.70	33.09	30.34	38.94	61.20	37.55	34.04	33.85
Nevada	12.16	11.82	4.36	28.34	45.20	49.72	53.06	34.19	42.91	37.34
Mountain	**14.99**	**21.57**	**3.82**	**40.38**	**39.20**	**42.71**	**49.46**	**42.81**	**40.92**	**39.04**
Washington	11.03	16.02	6.88	33.93	38.70	36.82	54.69	38.42	38.98	38.01
Oregon	9.84	16.64	9.25	35.73	28.11	24.45	52.41	39.46	31.16	31.88
California	11.22	12.92	7.04	31.18	30.88	25.96	55.07	13.66	24.70	27.23
Pacific	**11.10**	**13.57**	**7.17**	**31.84**	**31.87**	**26.75**	**54.46**	**17.31**	**27.26**	**28.20**
Average for 48 States & D. C.	**6.40**	**13.12**	**12.04**	**31.56**	**35.55**	**20.37**	**55.71**	**27.76**	**32.24**	**31.78**
Alaska	9.73	23.68	15.35	48.76	33.35	44.74	50.25	57.17	39.58	43.52
Hawaii	13.49	7.51	22.05	43.05	23.95	22.32	59.20	55.66	30.21	36.20
Puerto Rico	12.24	5.37	10.38	27.99	22.34	21.24	57.87	15.40	22.61	27.29
United States: 1959-60	**6.50**	**12.99**	**12.06**	**31.55**	**35.57**	**20.38**	**55.78**	**27.85**	**32.18**	**31.76**
1958-59[5]	**6.22**	**12.54**	**11.91**	**30.67**	**34.86**	**18.61**	**55.89**	**[6]26.63**	**[6]31.01**	**30.78**
1957-58[5]	**5.96**	**12.53**	**11.73**	**30.22**	**34.43**	**17.95**	**55.67**	**25.48**	**30.11**	**30.18**

[1] Includes only fertilizers guaranteed to contain one or more of the primary nutrients, N, P_2O_5, or K_2O. [2] Guaranteed to contain two or more of the primary nutrients. [3] Guaranteed to contain one of the primary nutrients. [4] Includes 2 percent of the colloidal phosphate and 3 percent of the phosphate rock. [5] Does not include Alaska. [6] Revised.

Table 8.—Direct-application fertilizer materials consumed, by State and region, year ended June 30, 1960[1]

Tons

State and region	Chemical nitrogen materials										Phosphate materials[2]				Potash materials[2]		Total	
												Superphosphates						
	Ammonia (anhydrous)	Ammonium nitrate	Ammonium nitrate-limestone mixtures	Ammonium sulfate	Calcium cyanamide	Nitrogen solutions and aqua ammonia[2]	Sodium nitrate	Urea	Other[2]	Natural organics[2]	Phosphate rock[3]	Grades 22 percent and under	Grades over 22 percent	Other	Chlorides 50-62 percent grades	Other	Primary nutrient materials	Secondary and trace nutrient materials[2]
Maine	0	1,228	0	72	126	364	146	162	118	708	43	5,024	30	113	69	15	8,218	19
New Hampshire	0	900	3	1	38	149	50	116	94	758	0	1,834	0	53	88	3	4,087	13
Vermont	0	888	0	0	1	319	76	334	36	166	281	15,554	5	33	246	4	17,943	13
Massachusetts	0	1,299	3	150	212	199	752	296	229	8,135	71	2,896	0	513	366	12	15,133	13
Rhode Island	0	96	0	0	83	0	28	35	156	1,008	16	212	0	47	40	2	1,723	5
Connecticut	0	787	40	29	165	764	553	305	752	6,040	55	4,537	34	624	332	864	15,881	386
New England	**0**	**5,198**	**46**	**252**	**625**	**1,795**	**1,605**	**1,248**	**1,385**	**16,815**	**466**	**30,057**	**69**	**1,383**	**1,141**	**900**	**62,985**	**449**
New York	515	14,353	675	409	2,266	1,705	3,116	2,853	2,527	14,362	711	26,209	1,200	638	1,122	2,043	74,704	435
New Jersey	237	3,513	232	1,284	1,164	275	1,935	733	1,568	6,389	414	2,636	7	1,259	1,155	272	23,073	201
Pennsylvania	1,022	9,205	21	9,448	1,157	974	2,062	1,957	1,838	12,156	4,600	26,417	530	3,178	2,491	762	77,818	4,061
Delaware	88	862	32	13	487	1,190	158	183	2	422	182	284	205	44	458	16	4,626	323
District of Columbia	0	10	0	2	0	0	15	2	21	1,210	0	8	0	42	11	0	1,321	9
Maryland	1,063	2,987	527	114	1,089	3,343	2,969	378	424	1,714	1,685	2,443	90	870	788	169	20,653	738
West Virginia	0	772	33	209	15	0	1,447	73	120	428	104	7,184	899	94	144	2	11,524	45
Middle Atlantic	**2,925**	**31,702**	**1,520**	**11,479**	**6,178**	**7,487**	**11,702**	**6,179**	**6,500**	**36,681**	**7,696**	**65,181**	**2,931**	**6,125**	**6,169**	**3,264**	**213,719**	**5,812**
Virginia	1,040	4,613	19,713	358	948	16,050	11,187	881	130	1,100	1,970	8,709	1,449	1,883	4,030	12,440	86,501	16,619
North Carolina	5,635	16,074	97,255	279	4,529	56,596	59,106	587	100	3,278	641	12,015	33	2,690	9,672	8,776	277,266	41,118
South Carolina	2,044	16,363	57,719	132	376	35,167	63,031	142	103	1,464	98	8,137	102	4,288	11,854	1,137	202,157	3,381
Georgia	13,133	94,731	39,675	1,951	518	53,315	63,496	179	445	2,052	838	3,925	49	3,459	5,497	1,952	285,215	40,687
Florida	4,026	25,257	4,382	3,064	2,009	10,630	27,131	2,701	11,220	23,345	22,114	10,395	395	4,891	2,537	18,713	172,646	6,267
South Atlantic	**25,878**	**157,038**	**218,744**	**5,784**	**8,380**	**171,758**	**223,951**	**4,490**	**11,998**	**31,239**	**25,661**	**43,181**	**1,864**	**17,211**	**33,590**	**43,018**	**1,023,785**	**108,072**
Ohio	5,503	20,756	1,888	19,776	225	9,810	562	7,490	2,446	9,417	4,394	19,066	5,282	4,641	9,193	908	121,357	243
Indiana	36,035	43,311	7	11,304	298	60,501	111	11,313	909	2,146	11,508	9,016	11,843	6,569	67,308	1,903	274,082	272
Illinois	27,889	70,810	32	62,495	125	33,649	32	2,724	2,891	10,141	451,119	16,354	63,619	14,336	95,866	176	852,258	567
Michigan	7,086	13,915	0	3,834	27	10,617	1,165	5,021	3,422	12,854	2,415	6,092	1,348	3,072	7,082	2,363	80,313	3,871
Wisconsin	3,391	6,162	0	1,100	0	4,844	0	271	1,032	6,713	1,854	3,313	1,607	4,926	16,163	798	52,174	507
East North Central	**79,904**	**154,954**	**1,927**	**98,509**	**675**	**119,421**	**1,870**	**26,819**	**10,700**	**41,271**	**471,290**	**53,841**	**83,699**	**33,544**	**195,612**	**6,148**	**1,380,184**	**5,460**
Minnesota	7,062	19,516	67	1,957	0	22,739	0	492	740	11,159	1,547	14,292	23,695	28,229	10,965	2,607	145,067	221
Iowa	31,187	67,606	0	4,416	0	46,060	0	1,087	665	1,651	2,000	23,266	31,612	26,024	14,459	167	250,200	539
Missouri	28,547	78,612	0	2,132	150	20,400	424	776	478	3,564	119,866	2,062	15,426	6,526	19,060	232	298,255	164
North Dakota	2,995	3,426	0	35	0	485	0	30	45	132	110	15	25,638	61,039	73	0	94,023	2
South Dakota	1,097	6,870	0	116	0	2,604	0	268	148	321	30	154	4,766	7,164	34	0	23,572	0
Nebraska	83,627	59,537	0	881	0	88,855	0	1,900	350	676	314	1,390	17,493	16,380	479	129	272,011	248
Kansas	16,290	76,108	0	686	0	35,875	0	944	338	832	468	446	29,506	57,582	1,297	103	220,475	94
West North Central	**170,805**	**311,675**	**67**	**10,223**	**150**	**217,018**	**424**	**5,497**	**2,764**	**18,335**	**124,335**	**41,625**	**148,136**	**202,944**	**46,367**	**3,238**	**1,303,603**	**1,268**
Kentucky	4,914	32,753	243	1,251	1,165	6,476	1,876	296	109	755	8,386	21,029	5,353	5,574	11,635	5,461	107,276	111
Tennessee	13,143	42,279	197	248	1,988	1,386	24,167	93	87	1,125	5,377	9,568	2,474	10,634	11,976	8,262	133,004	404
Alabama	7,592	84,427	31,062	8,895	205	7,800	73,726	23	2,029	567	773	22,228	26	17,208	8,579	709	265,849	3,917
Mississippi	45,921	124,224	5,568	3,991	5,725	16,715	59,301	3,592	1,697	108	2,301	35,469	4,937	42,463	18,411	1,232	371,655	326
East South Central	**71,570**	**283,683**	**37,070**	**14,385**	**9,083**	**32,377**	**159,070**	**4,004**	**3,922**	**2,555**	**16,837**	**88,294**	**12,790**	**75,879**	**50,601**	**15,664**	**877,784**	**4,758**
Arkansas	23,111	49,556	9	2,513	5,309	15,742	30,042	13,754	116	76	1,005	4,710	10,447	1,240	32,126	1,074	190,830	3
Louisiana	27,741	40,420	362	11,138	1,125	10,117	22,663	3,042	1,062	473	5,681	6,756	2,506	6,486	3,973	291	143,836	1,175
Oklahoma	3,057	8,270	0	1,160	0	2,652	701	425	34	1,792	2,509	12,722	10,804	23,003	474	18	67,621	32
Texas	111,694	29,125	3,132	65,251	1,569	15,956	1,245	13,755	45	4,811	14,238	26,069	20,816	98,351	1,434	1,028	408,519	2,289
West South Central	**165,603**	**127,371**	**3,503**	**80,062**	**8,003**	**44,467**	**54,651**	**30,976**	**1,257**	**7,152**	**23,433**	**50,257**	**44,573**	**129,080**	**38,007**	**2,411**	**810,806**	**3,499**
Montana	1,641	6,707	0	511	0	609	0	52	108	177	0	0	16,831	13,660	6	0	40,302	428
Idaho	6,121	23,574	1	14,922	2,423	15,673	0	700	242	228	50	932	24,425	29,179	71	0	118,541	11,899
Wyoming	1,008	3,865	0	658	0	1,512	0	495	104	10	0	38	4,922	4,018	22	18	16,670	384
Colorado	9,250	23,767	1	5,021	11	3,896	0	2,159	701	2,158	40	2,870	14,697	10,507	391	440	75,909	1,418
New Mexico	5,818	2,370	0	3,799	0	2,805	0	2,672	111	514	0	7,393	8,537	7,580	65	132	41,796	347
Arizona	23,147	6,759	1,049	14,314	324	12,828	448	12,701	10,903	3,433	0	6,420	3,368	40,172	94	988	136,948	13,814
Utah	447	11,971	1	5,189	0	210	96	288	646	1,026	0	3,231	7,294	3,688	66	0	34,153	101
Nevada	647	215	1	385	0	439	17	60	48	208	0	0	416	823	0	4	3,263	300
Mountain	**48,079**	**79,228**	**1,053**	**44,799**	**2,758**	**37,972**	**561**	**19,127**	**12,863**	**7,754**	**90**	**20,884**	**80,490**	**109,627**	**715**	**1,582**	**467,582**	**28,691**
Washington	40,801	24,202	69	17,797	126	79,474	55	3,777	2,227	4,772	214	4,659	4,997	27,845	4,630	1,184	216,829	8,217
Oregon	5,098	19,619	0	38,857	709	29,849	0	7,198	2,057	701	54	9,666	1,672	39,397	1,995	808	157,680	11,463
California	97,541	36,062	0	187,940	5,575	293,733	322	26,681	31,629	[4]324,057	241	98,213	15,283	109,291	1,920	5,372	1,233,860	1,197,247
Pacific	**143,440**	**79,883**	**69**	**244,594**	**6,410**	**403,056**	**377**	**37,656**	**35,913**	**329,530**	**509**	**112,538**	**21,952**	**176,533**	**8,545**	**7,364**	**1,608,369**	**1,216,927**
48 States & D. C.	**708,204**	**1,230,732**	**263,999**	**510,087**	**42,262**	**1,035,351**	**454,211**	**135,996**	**87,302**	**491,332**	**670,317**	**505,858**	**396,504**	**752,326**	**380,747**	**83,589**	**7,748,817**	**1,374,936**
Alaska	0	[5]	0	[5]	0	0	0	[5]	0	0	0	[5]	[5]	0	[5]	[5]	2,458	11
Hawaii	0	562	0	4,373	0	32,073	112	5,710	581	37	3,208	479	6,532	2,993	8,419	1,088	66,167	3,182
Puerto Rico	594	0	0	20,335	4	9,897	18	492	15	95	0	474	11	8	203	76	32,222	0
United States: 1959-60	**708,798**	**1,231,294**	**263,999**	**534,795**	**42,266**	**1,077,321**	**454,341**	**142,198**	**87,898**	**491,464**	**673,525**	**506,811**	**403,047**	**755,327**	**389,369**	**84,753**	**7,849,664**	**1,378,129**
1958-59[6]	**681,073**	**1,272,797**	**306,351**	**549,945**	**40,838**	**987,258**	**479,374**	**110,176**	**65,992**	**517,948**	**837,668**	**509,272**	**403,566**	**763,251**	**405,581**	[7]**84,919**	**8,016,009**	**1,223,204**
1957-58[6]	**583,434**	**1,116,908**	**263,512**	**577,111**	**46,348**	**689,608**	**435,509**	**98,383**	**66,564**	**493,252**	**851,545**	**477,890**	**374,363**	**700,047**	**364,790**	**83,748**	**7,223,012**	**939,728**

[1] Excludes liming materials and the quantities of materials used in the manufacture of commercial mixtures. [2] The principal kinds are shown separately, by regions, in table 1. [3] Includes colloidal phosphate, the quantity of which is shown separately, by regions, in table 1. [4] Includes an estimate of 270,000 tons of dried manures. [5] Included in the total. [6] Does not include Alaska. [7] Revised: 4,432 tons of potassium-sodium nitrate was subtracted from the South Carolina total.

grades 11-48-0 and 21-53-0 being used.

The averages of the total nutrient contents of materials, shown in column 10, table 7, are indicative of the relative grades of products consumed in principal quantities in each designated area. It is evident from these averages that products consumed in the New England region have, on the average, a lower primary-nutrient content than materials consumed in any other region.

Secondary and Trace Nutrient Materials

The quantities of the secondary and trace nutrient materials marketed to consumers for use as such are shown for each region in table 1 and their total for each State in table 8. In addition, there are amounts of these blended into commercial mixtures and no doubt retail sales of products supplied through chemical manufacturers for which no records of their use as fertilizer are available. The principal sources of the secondary nutrient elements, calcium, magnesium, and sulfur are limestone, dolomite, and gypsum, respectively. Other products such as ammonium nitrate-limestone mixtures, potassium-magnesium sulfate, and ammonium sulfate are sometimes used for these nutrients as these offer the advantage of applying also the primary nutrients. The quantities of these products are shown in table 1. The more important trace nutrient elements boron, copper, iron, manganese, and zinc are required by plants only in very small amounts and are usually available in adequate quantities in most soils. Deficiencies of these occur in certain areas and under intensive culture these elements may be removed from the soil by plants in greater quantities than many soils can supply for considerable periods of time. Their use, therefore, is simply a matter of fitting a remedy to a specific need. To correct soil deficiencies, application of these usually in the form of the sulfate are commonly at rates of 10 to 50 pounds or more per acre depending on the crop and potential toxicity. It is also general practice to add these to mixtures in those areas where such need is justified. The average content of mixed fertilizers for boron is 0.29 percent B_2O_3, copper (0.45 percent CuO), iron (0.67 percent Fe_2O_3), manganese (0.81 percent MnO), and Zinc (0.48 percent ZnO).

In 1959-60, the total consumption of the secondary and trace nutrient materials for direct application collected in this survey amounted to 1,378,129 tons or 5.5 percent of all fertilizers used. The quantity of these materials was 154,925 tons (12.7 percent) more than the 1,223,204 tons used in 1958-59. In 1959-60, calcium sulfate (gypsum) comprised 1,296,955 tons or 94.1 percent of the total tonnage of this class of products. Other principal products were sulfur, sulfuric acid, lime-sulfur solution totaling 45,568 tons (3.3 percent), and metallic salts (31,450 tons, 2.3 percent). Most of the increase in tonnage of this class was in the principal product, gypsum (11.7 percent) largely used in the Pacific area for conditioning alkaline soils. A decrease was recorded in the South Atlantic region where it is principally used on peanuts. The other sulfur bearing products increased (21.2 percent) and the metallic salts (27.7 percent) compared with consumption in 1958-59.

Table 9.—Change in consumption of classes of direct-application fertilizer materials, by region, year ended June 30, 1960, compared with preceding year

Region	Increase or Decrease (—)							
	Chemical nitrogen materials		Natural organic materials		Phosphate materials		Potash materials	
	Tons	Percent	Tons	Percent	Tons	Percent	Tons	Percent
New England	416	3.5	—8,202	—32.8	3,038	10.5	—630	—23.6
Middle Atlantic	7,448	9.5	—4,257	—10.4	—2,301	—2.7	193	2.1
South Atlantic	—52,142	—5.9	156	.5	—16,448	—15.8	—9,177	—10.7
East North Central	1,372	.3	—10,457	—20.2	—57,034	—8.2	—4,900	—2.4
West North Central	31,468	4.6	—951	—4.9	—114,770	—18.2	—2,354	4.5
East South Central	34,059	5.9	—273	—9.6	—52,784	—21.4	2,246	3.5
West South Central	42,467	9.0	297	4.3	12,013	5.1	1,337	3.4
Mountain	—6,398	—2.5	1,839	31.1	15,203	7.8	—529	—18.7
Pacific	—530	.1	—4,615	—1.4	41,416	15.3	674	4.4
Other	—9,054	—10.8	—21	—13.7	—3,380	—19.8	—3,238	—24.9
United States	**49,106**	**1.1**	**—26,484**	**—5.1**	**—175,047**	**—7.0**	**—16,378**	**—3.3**

Primary Plant Nutrients

During the year, ended June 30, 1960, fertilizers used in the United States, including Alaska, Hawaii, and Puerto Rico, contained 7,463,714 tons of primary plant nutrients (N, available P_2O_5, K_2O) (table 11). This quantity represented a small increase in primary nutrients (47,459 tons, 0.6 percent) although consumption of fertilizer products containing these nutrients was less than in the preceding year. Consumption of nitrogen was 2,738,047 tons, an increase of 65,571 tons (2.4 percent); available P_2O_5, 2,572,348 tons or 20,390 tons (0.8 percent) more; and K_2O, 2,153,319 tons, a decrease of 38,502 tons (1.8 percent) from the preceding year. The differences in consumption excludes the quantities consumed in Alaska as the amount used in that State in 1958-59 was not available for comparison.

Mixtures supplied 1,017,415 tons or 37.1 percent of the N, 2,033,316 tons or 79.0 percent of the available P_2O_5, and 1,886,798 tons or 87.6 percent of the K_2O. These quantities represented increases of 2.4 and 0.8 percent for N and available P_2O_5, respectively, but a decrease of 1.8 percent for K_2O compared with consumption in 1958-59.

Materials used for direct application supplied 1,720,632 tons or 62.9 percent of the N, 539,032 tons or 21.0 percent of the available P_2O_5, and 266,521 tons or 12.4 percent of the K_2O. These quantities represented increases of 2.9 and 0.3 percent for N and available P_2O_5, respectively, but a decrease of 3.9 percent for K_2O from the preceding year.

Total consumption of primary nutrients in 1959-60 was not too significantly different from consumption in 1958-59. The pattern of change in use was about the same in both mixtures and in direct-application materials in that the amount of nitrogen and available P_2O_5 increased, but that of K_2O decreased. Consumption of one or more of the nutrients supplied either by mixtures or by materials increased in 45 of 51 areas (table 12). In 23 of these 45 areas, however, the increase in the quantity of a nutrient supplied either by a mixture or a material was offset by a decrease of that nutrient in the other category. In the other 22 areas the increase of a nutrient in one category was not offset by a decrease in the other category. Net increases occurred mostly in areas west of

Table 10.—Ammoniated phosphates consumed as direct-application fertilizer materials, by State and region, year ended June 30, 1960

State and region[1]	Grade[2]				
	11-48	13-39	16-20	27-14	21-53
	Tons	Tons	Tons	Tons	Tons
Maine	0	0	0	0	3
Massachusetts	1	0	0	0	0
New England	**1**	**0**	**0**	**0**	**3**
New York	81	3	0	0	0
New Jersey	76	0	0	0	0
Pennsylvania	2,172	0	0	0	98
Delaware	13	0	0	0	0
Maryland	108	0	0	0	12
West Virginia	13	0	0	0	0
Middle Atlantic	**2,463**	**3**	**0**	**0**	**110**
Virginia	106	0	0	0	295
North Carolina	0	0	0	0	87
South Carolina	0	0	0	0	10
Georgia	0	0	0	69	256
Florida	4	0	0	0	13
South Atlantic	**110**	**0**	**0**	**69**	**661**
Ohio	3,043	0	10	0	1,043
Indiana	5,747	8	16	0	609
Illinois	5,541	89	830	71	2,325
Michigan	2,138	0	0	0	469
Wisconsin	901	0	356	54	82
East North Central	**17,370**	**97**	**1,212**	**125**	**4,528**
Minnesota	10,888	3,686	8,078	1,685	1,925
Iowa	2,697	2,489	10,212	2,074	731
Missouri	1,322	499	1,420	5	834
North Dakota	30,176	4,338	23,349	2,388	745
South Dakota	1,690	342	4,176	714	203
Nebraska	4,385	1,354	7,379	531	2,638
Kansas	1,011	9,997	46,414	0	97
West North Central	**52,169**	**22,705**	**101,028**	**7,397**	**7,173**
Kentucky	0	17	0	0	485
Tennessee	0	0	0	2,092	1,762
Alabama	2	0	0	0	486
Mississippi	0	0	96	1,205	239
East South Central	**2**	**17**	**96**	**3,297**	**2,972**
Arkansas	66	101	919	0	0
Louisiana	212	21	3,517	0	0
Oklahoma	838	9,311	12,233	0	63
Texas	3,617	8,911	80,490	0	1,044
West South Central	**4,733**	**18,344**	**97,159**	**0**	**1,107**
Montana	4,801	167	6,078	635	0
Idaho	3,986	24	17,346	4,480	279
Wyoming	979	15	849	201	1,436
Colorado	760	305	1,221	20	6,364
New Mexico	496	1,135	5,148	0	497
Arizona	3,205	2,542	27,817	337	1,756
Utah	1,283	0	1,774	272	17
Nevada	92	24	547	0	33
Mountain	**15,602**	**4,212**	**60,780**	**5,945**	**10,382**
Washington	6,123	1,151	11,728	5,704	142
Oregon	4,032	1,988	32,608	352	104
California	12,382	2,669	73,163	1,889	2,862
Pacific	**22,537**	**5,808**	**117,499**	**7,945**	**3,108**
Alaska[3]	---	---	---	---	---
Hawaii	1,396	0	561	0	829
Puerto Rico	0	0	0	0	8
United States	**116,383**	**51,186**	**378,335**	**24,778**	**30,881**

[1] Consumption was not reported for unlisted States. [2] Includes the quantity of these grades reported as mixtures. All other NP grades except natural organics and bone meal are included in mixtures. [3] Total consumed 481 tons, principally in grades 11-48 and 16-20.

the Mississippi River.

Compared with 1958-59, the use of nitrogen increased 65,571 tons, of which 17,272 tons were supplied by mixtures and 48,299 tons by materials. Changes in nitrogen consumed in areas ranged from an increase of 22,283 tons (Texas) to a decrease of 18,276 tons (North Carolina). Consumption of available P_2O_5 increased 20,390 tons, of which 18,563 tons were supplied by mixtures and 1,827 tons by materials. Changes in available P_2O_5 consumed in areas ranged from an increase of 22,222 tons (Alabama) to a decrease of 10,155 tons (North Carolina). Although consumption of available P_2O_5 increased, consumption of total P_2O_5 decreased 30,448 tons principally as the result of the relatively large decrease in use of phosphate rock for direct application in Illinois and Missouri. The content of P_2O_5 in phosphate rock is taken as three percent for available and 32 percent for total. The total use of K_2O decreased 38,502 tons, 27,791 tons were in mixtures and 10,711 tons in materials. Nevertheless, the change in consumption in some areas increased as high as 8,546 tons (Florida) and in others decreased as low as 12,448 tons (Illinois).

The quantities of primary nutrients supplied by the kinds of fertilizer used in 1959-60 (table 1) are shown for each region in table 13. Nearly 70 percent of the total consumption of nitrogen was as N-P-K mixtures, anhydrous ammonia and ammonium nitrate—which supplied, respectively, 33.1, 21.2, and 15.2 percent. These three commodities accounted for more than one-half of the nitrogen consumed in each region except the Pacific. In this region, the principal use of nitrogen was as anhydrous ammonia, aqua amomnia, and ammonium sulfate. Compared with 1958-59, the principal increases were in the form of N-P mixtures, nitrogen solutions, and urea. The increase in nitrogen was accountable to the greater use of N-P mixtures in the West North Central region, increases in the use of urea particularly in the East North Central and Pacific regions, and increased consumption of nitrogen solutions in all regions.

More than 68 percent of the total consumption of available P_2O_5 was in the form of N-P-K mixtures. In all regions except the Mountain and Pacific from nearly 50 percent (West North Central) to 91 percent (South Atlantic) of the available P_2O_5 consumed was in this type of mixture.

Table 11.—Primary nutrients contained in mixtures consumed and the total in mixtures and direct-application materials consumed, by State and region, year ended June 30, 1960

Tons

State and region	Mixtures					Mixtures and materials				
	N	P_2O_5		K_2O	Total N, available P_2O_5, and K_2O	N	P_2O_5		K_2O	Total N, available P_2O_5, and K_2O
		Available	Total				Available[1]	Total[2]		
Maine	12,738	18,230	18,763	19,055	50,023	13,462	19,312	19,870	19,112	51,886
New Hampshire	1,146	1,768	1,838	1,841	4,755	1,620	2,195	2,276	1,903	5,718
Vermont	2,350	6,055	6,232	6,820	15,225	2,930	9,206	9,532	6,979	19,115
Massachusetts	5,412	6,826	7,114	6,581	18,819	6,761	7,766	8,117	6,912	21,439
Rhode Island	977	1,463	1,533	1,486	3,926	1,131	1,551	1,626	1,527	4,209
Connecticut	4,503	5,952	6,273	6,023	16,478	5,838	7,358	7,756	6,660	19,856
New England	**27,126**	**40,294**	**41,753**	**41,806**	**109,226**	**31,742**	**47,388**	**49,177**	**43,093**	**122,223**
New York	35,786	63,438	65,806	55,769	154,993	45,522	69,997	72,789	57,382	172,901
New Jersey	13,209	22,765	23,414	22,285	58,259	16,649	23,790	24,528	23,153	63,592
Pennsylvania	33,856	73,340	76,082	69,957	177,153	42,738	81,039	85,294	71,871	195,648
Delaware	4,922	9,549	9,888	10,916	25,387	5,946	9,739	10,135	11,206	26,891
District of Columbia	274	393	426	237	904	341	449	487	260	1,050
Maryland	15,483	31,368	33,669	31,273	78,124	19,731	32,365	35,177	31,819	83,915
West Virginia	2,936	7,952	8,448	7,106	17,994	3,560	9,907	10,509	7,201	20,668
Middle Atlantic	**106,466**	**208,805**	**217,733**	**197,543**	**512,814**	**134,487**	**227,286**	**238,919**	**202,892**	**564,665**
Virginia	28,675	72,287	77,113	78,192	179,154	43,083	75,630	81,097	81,624	200,337
North Carolina	59,572	120,505	129,958	137,229	317,306	115,947	123,618	133,311	144,853	384,418
South Carolina	25,033	58,550	63,493	64,316	147,899	62,203	60,638	65,689	72,028	194,869
Georgia	50,919	120,770	127,682	139,448	311,137	126,910	122,158	129,353	143,225	392,293
Florida	87,619	87,192	106,876	127,633	302,444	114,770	91,189	117,368	132,523	338,482
South Atlantic	**251,818**	**459,304**	**505,122**	**546,818**	**1,257,940**	**462,913**	**473,233**	**526,818**	**574,253**	**1,510,399**
Ohio	63,833	148,701	153,280	128,419	340,953	88,271	157,740	163,929	134,305	380,316
Indiana	58,720	150,311	154,417	143,512	352,543	132,573	161,312	168,936	184,789	478,674
Illinois	45,997	101,930	105,879	84,074	232,001	118,554	154,571	290,692	142,592	415,717
Michigan	39,325	96,544	99,590	87,900	223,769	58,204	100,469	104,355	92,952	251,625
Wisconsin	17,718	62,285	64,028	78,347	158,350	25,550	66,873	69,403	88,353	180,776
East North Central	**225,593**	**559,771**	**577,194**	**522,252**	**1,307,616**	**423,152**	**640,965**	**797,315**	**642,991**	**1,707,108**
Minnesota	27,628	88,850	90,798	60,288	176,766	54,022	114,365	117,448	68,298	236,685
Iowa	33,593	85,567	89,055	55,936	175,096	103,117	115,070	119,833	64,837	283,024
Missouri	51,766	73,492	76,769	67,362	192,620	110,240	87,659	125,769	79,110	277,009
North Dakota	8,121	14,667	15,079	1,540	24,328	20,456	48,192	49,325	1,588	70,236
South Dakota	2,033	2,992	3,191	163	5,188	7,379	7,260	7,527	186	14,825
Nebraska	5,630	12,388	12,527	1,697	19,715	125,436	26,563	27,037	2,033	154,032
Kansas	14,146	30,274	31,069	6,770	51,190	74,168	57,875	59,542	7,614	139,657
West North Central	**142,917**	**308,230**	**318,488**	**193,756**	**644,903**	**494,818**	**456,984**	**506,481**	**223,666**	**1,175,468**
Kentucky	26,313	56,087	59,468	57,676	140,076	44,517	66,374	72,433	67,116	178,007
Tennessee	30,097	59,275	62,830	59,964	149,336	61,059	66,280	71,481	68,356	195,695
Alabama	31,673	92,900	98,882	88,047	212,620	89,440	99,126	105,446	93,193	281,759
Mississippi	20,128	34,181	36,489	31,557	85,866	119,969	48,600	51,806	42,730	211,299
East South Central	**108,211**	**242,443**	**257,669**	**237,244**	**587,898**	**314,985**	**280,380**	**301,166**	**271,395**	**866,760**
Arkansas	12,463	28,015	29,247	26,827	67,305	66,316	34,103	35,747	46,332	146,751
Louisiana	12,401	22,943	24,162	20,483	55,827	60,004	26,721	29,563	22,957	109,682
Oklahoma	7,515	15,706	16,283	6,098	29,319	17,373	30,405	32,049	6,406	54,184
Texas	28,720	55,034	56,848	25,370	109,124	170,975	95,488	102,415	26,500	292,963
West South Central	**61,099**	**121,698**	**126,540**	**78,778**	**261,575**	**314,668**	**186,717**	**199,774**	**102,195**	**603,580**
Montana	698	809	843	93	1,600	6,319	13,537	13,912	98	19,954
Idaho	3,901	4,870	4,893	249	9,020	28,785	24,441	25,502	298	53,524
Wyoming	182	296	310	13	491	3,773	4,321	4,412	30	8,124
Colorado	2,621	4,623	4,805	1,197	8,441	23,510	17,477	17,891	1,596	42,583
New Mexico	512	885	927	194	1,591	10,163	8,474	8,771	288	18,925
Arizona	4,476	6,859	7,106	1,463	12,798	45,539	21,552	21,996	2,038	69,129
Utah	1,173	1,288	1,369	218	2,679	7,470	6,564	6,771	270	14,304
Nevada	246	239	258	88	573	1,182	700	729	92	1,974
Mountain	**13,809**	**19,869**	**20,511**	**3,515**	**37,193**	**126,741**	**97,066**	**99,984**	**4,710**	**228,517**
Washington	5,674	8,239	8,597	3,538	17,451	75,476	19,667	20,216	6,839	101,982
Oregon	2,906	4,918	5,066	2,734	10,558	38,103	17,381	17,712	4,210	59,694
California	37,795	43,541	44,618	23,709	105,045	[3]268,487	[3]105,194	[3]109,249	[3]36,078	409,759
Pacific	**46,375**	**56,698**	**58,281**	**29,981**	**133,054**	**382,066**	**142,242**	**147,177**	**47,127**	**571,435**
48 States and D. C.	**983,414**	**2,017,112**	**2,123,291**	**1,851,693**	**4,852,219**	**2,685,572**	**2,552,261**	**2,866,811**	**2,112,322**	**7,350,155**
Alaska	180	438	438	284	902	818	671	672	386	1,875
Hawaii	7,813	4,347	4,456	12,769	24,929	18,638	7,886	9,034	18,397	44,921
Puerto Rico	26,008	11,419	13,043	22,052	59,479	33,019	11,530	13,157	22,214	66,763
United States:										
1959-60	**1,017,415**	**2,033,316**	**2,141,228**	**1,886,798**	**4,937,529**	**2,738,047**	**2,572,348**	**2,889,674**	**2,153,319**	**7,463,714**
1958-59[4]	**999,963**	**2,014,315**	**2,126,664**	**1,914,305**	**4,928,583**	**[5]2,671,658**	**2,551,287**	**2,919,450**	**[6]2,191,435**	**7,414,380**
1957-58[4]	**855,204**	**1,798,590**	**1,903,452**	**1,683,910**	**4,337,704**	**2,284,359**	**2,292,890**	**2,655,300**	**1,935,138**	**6,512,387**

[1] Includes 2 percent of the colloidal phosphate and 3 percent of the phosphate rock marketed for direct application. [2] Includes 22 percent of the colloidal phosphate and 32 percent of the phosphate rock marketed for direct application. [3] Includes 3,564 tons N, 3,591 tons available and total P_2O_5 and 8,100 tons K_2O in an estimated 270,000 tons of dried manures. [4] Does not include Alaska. [5] Revised: 674 tons was subtracted from South Carolina total. [6] Revised: 659 tons was subtracted from South Carolina total.

Table 12.—Change in consumption of primary nutrients supplied in mixtures and in direct-application materials, by State and region, year ended June 30, 1960, compared with preceding year

Tons

State and region	Mixtures					Materials				
	N	P_2O_5		K_2O	Total (N, avail. P_2O_5, and K_2O)	N	P_2O_5		K_2O	Total (N, avail. P_2O_5, and K_2O)
		Available	Total				Available	Total		
Maine	—1,609	—2,363	—2,429	—2,323	—6,295	— 66	473	466	— 117	290
New Hampshire	— 92	— 303	— 314	— 362	— 757	30	— 49	— 65	— 20	— 39
Vermont	199	442	443	662	1,303	19	219	244	— 86	152
Massachusetts	214	— 363	— 377	— 345	— 494	— 171	— 281	— 285	— 163	— 615
Rhode Island	— 9	— 50	— 51	— 45	— 104	— 3	— 2	— 4	5	0
Connecticut	3	— 123	— 155	— 383	— 503	— 125	— 125	— 130	— 96	— 346
New England	**—1,294**	**—2,760**	**—2,883**	**—2,796**	**—6,850**	**— 316**	**235**	**226**	**— 477**	**— 558**
New York	— 608	—1,900	—2,105	— 762	—3,360	— 141	— 780	— 750	— 69	— 990
New Jersey	— 326	—1,856	—1,931	—1,502	—3,684	— 31	— 323	— 341	— 197	— 551
Pennsylvania	752	— 699	— 729	— 561	— 508	—1,329	600	671	26	1,955
Delaware	— 163	— 664	— 686	— 585	—1,412	— 17	80	123	154	217
District of Columbia	— 18	32	34	7	21	12	2	4	11	25
Maryland	— 167	—1,449	—1,550	— 274	—1,890	381	— 248	— 252	41	174
West Virginia	— 164	— 61	— 75	37	— 188	36	162	131	— 38	160
Middle Atlantic	**— 694**	**—6,687**	**—7,042**	**—3,640**	**—11,021**	**1,569**	**— 507**	**— 414**	**— 72**	**990**
Virginia	— 974	—3,561	—3,843	—2,400	—6,935	— 678	— 638	— 305	— 126	—1,442
North Carolina	—3,876	—8,921	—9,557	—9,244	—22,041	—14,400	—1,234	—1,583	— 706	—16,340
South Carolina	—2,209	—6,766	—7,292	—2,801	—11,776	—6,754	— 558	— 675	—2,437	—9,749
Georgia	—1,804	—5,026	—5,287	—1,134	—7,964	8,752	—1,269	—1,359	— 426	7,057
Florida	8,904	1,565	2,415	8,796	19,265	903	—1,017	1,215	— 250	— 364
South Atlantic	**41**	**—22,709**	**—23,564**	**—6,783**	**—29,451**	**—12,177**	**—4,716**	**—2,707**	**—3,945**	**—20,838**
Ohio	3,823	4,754	4,695	— 225	8,352	508	— 419	— 763	— 42	47
Indiana	— 872	—4,289	—4,520	—4,825	—9,986	10,288	—1,583	—1,260	590	9,295
Illinois	—2,722	—5,106	—5,507	—6,156	—13,984	—9,707	—1,700	—17,919	—6,292	—17,699
Michigan	—2,521	—7,158	—7,505	—8,791	—18,470	974	— 743	—1,045	704	935
Wisconsin	—1,387	—5,995	—6,227	—9,062	—16,444	—2,037	2,055	1,838	— 531	— 513
East North Central	**—3,679**	**—17,794**	**—19,064**	**—29,059**	**—50,532**	**26**	**—2,390**	**—19,149**	**—5,571**	**—7,935**
Minnesota	3,250	4,094	4,113	—2,015	5,329	—12,838	1,509	1,778	— 409	—11,738
Iowa	2,668	4,169	4,203	— 302	6,535	6,710	—6,631	—8,084	—1,456	—1,377
Missouri	—1,684	— 723	— 873	— 249	—2,656	1,012	—2,505	—34,673	700	— 793
North Dakota	1,941	3,657	3,750	29	5,627	482	838	849	40	1,360
South Dakota	465	512	535	— 28	949	— 784	— 800	— 941	— 15	—1,599
Nebraska	755	1,372	1,380	27	2,154	3,618	— 224	— 411	— 107	3,287
Kansas	2,855	7,196	7,328	1,214	11,265	9,985	1,623	1,383	126	11,482
West North Central	**10,250**	**20,277**	**20,436**	**—1,324**	**29,203**	**8,185**	**—6,190**	**—40,099**	**—1,373**	**622**
Kentucky	— 14	—1,223	—2,625	—2,366	—3,603	— 186	—1,070	—1,446	493	— 763
Tennessee	1,819	1,461	758	3,186	6,466	5,260	583	1,062	— 324	5,519
Alabama	2,188	23,801	23,829	4,355	30,344	3,201	—1,579	—1,729	— 315	1,307
Mississippi	— 1	1,983	1,992	1,988	3,970	5,995	—1,911	—1,321	1,525	5,609
East South Central	**3,992**	**26,022**	**23,954**	**7,163**	**37,177**	**14,270**	**—3,977**	**—3,434**	**1,379**	**11,672**
Arkansas	1,021	2,571	2,600	1,833	5,425	— 316	— 178	— 55	505	11
Louisiana	1,006	1,091	1,120	2,274	4,371	3,889	685	1,475	417	4,991
Oklahoma	968	1,670	1,717	495	3,133	3,257	972	519	— 26	4,203
Texas	1,698	4,849	4,600	424	6,971	20,585	2,327	2,953	— 226	22,686
West South Central	**4,693**	**10,181**	**10,037**	**5,026**	**19,900**	**27,415**	**3,806**	**4,892**	**670**	**31,891**
Montana	234	156	166	— 51	339	1,000	640	625	— 15	1,625
Idaho	1,368	2,138	2,072	82	3,588	1,484	3,592	3,712	— 405	4,671
Wyoming	— 32	8	5	— 27	— 51	524	721	726	— 3	1,242
Colorado	732	1,774	1,795	116	2,622	2,576	359	430	— 25	2,910
New Mexico	188	471	483	91	750	2,104	— 305	— 323	52	1,851
Arizona	631	1,839	1,880	259	2,729	—4,530	452	415	— 58	—4,136
Utah	339	306	319	16	661	217	381	356	12	610
Nevada	— 31	— 55	— 59	22	— 64	227	— 28	— 29	— 2	197
Mountain	**3,429**	**6,637**	**6,661**	**508**	**10,574**	**3,602**	**5,812**	**5,912**	**— 444**	**8,970**
Washington	955	1,327	1,399	— 422	1,860	9,782	712	669	193	10,687
Oregon	— 84	19	— 15	48	— 17	—3,502	3,475	3,282	319	292
California	537	4,601	4,851	2,430	7,568	1,598	6,526	7,470	538	8,662
Pacific	**1,408**	**5,947**	**6,235**	**2,056**	**9,411**	**7,878**	**10,713**	**11,421**	**1,050**	**19,641**
48 States & D. C.	**18,146**	**19,114**	**14,770**	**—28,849**	**8,411**	**50,452**	**2,786**	**—43,352**	**—8,783**	**44,455**
Alaska[1]	---	---	---	---	---	---	---	---	---	---
Hawaii	843	— 178	— 183	1,774	2,439	—1,538	— 960	—1,225	—1,980	—4,478
Puerto Rico	—1,717	— 373	— 461	— 716	—2,806	— 615	1	3	52	— 562
United States	**17,272**	**18,563**	**14,126**	**—27,791**	**8,044**	**48,299**	**1,827**	**—44,574**	**—10,711**	**39,415**

[1] Data for year ended June 30, 1959 was not available for comparison.

In the Mountain region 39 percent was consumed as superphosphate (grades over 22 percent P_2O_5) and 42 percent as N-P grades of mixtures and materials. Consumption of available P_2O_5 was from a variety of fertilizers in the Pacific region. Compared with 1958-59, the small increase in consumption of available P_2O_5 was accountable mostly to the increased use of the N-P grades of mixtures and materials.

Seventy-seven percent of the total consumption of K_2O was as N-P-K mixtures. The regional use in this form ranged from 61 percent (Pacific) to 85 percent (Middle Atlantic). Although the total consumption of K_2O was less than in 1958-59, these percentages were approximately the same in both years.

Table 13.—Primary nutrient content of the kinds of fertilizer consumed, by region, year ended June 30, 1960

Tons

Kind	New England	Middle Atlantic	South Atlantic	East North Central	West North Central	East South Central	West South Central	Mountain	Pacific	Alaska, Hawaii, and Puerto Rico	United States
Nitrogen											
MIXTURES: N-P-K	27,118	106,413	219,439	220,656	110,547	104,569	54,464	4,834	30,827	28,551	907,418
N-P	8	29	283	4,882	32,370	2,872	6,398	8,975	15,146	184	71,147
N-K	0	24	32,096	55	[1]	770	237	0	402	5,266	38,850
MATERIALS:											
Ammonia, anhydrous	0	2,401	21,246	65,601	140,232	58,759	135,960	39,473	117,764	488	581,924
Ammonia, aqua	0	0	194	1,574	3,396	1,108	1,739	4,764	63,998	8,604	85,380
Ammonium nitrate	1,756	10,644	52,984	52,335	105,546	95,743	42,903	26,756	26,998	190	415,855
Ammonium nitrate-limestone mixtures	9	314	45,844	403	14	7,649	722	216	14	0	55,185
Ammonium sulfate	52	2,369	1,219	20,666	2,153	3,017	16,896	9,391	51,148	5,170	112,078
Bonemeal: raw and steamed	51	84	45	59	7	9	5	1	35	3	299
Calcium cyanamide	132	1,313	1,780	139	32	1,938	1,667	580	1,389	1	8,971
Calcium nitrate	0	1	1,467	8	0	89	0	1,553	4,522	90	7,730
Natural organics	846	1,563	1,598	1,870	767	105	244	332	5,738	7	13,070
Nitrogen solutions	547	2,645	43,378	36,483	67,935	8,164	11,654	4,488	19,446	0	194,740
Phosphate products	1	304	175	3,163	28,598	1,531	18,470	15,943	25,279	424	93,888
Potassium products	13	36	2,331	37	0	251	150	0	0	0	2,818
Sodium nitrate	257	1,883	36,260	301	68	25,660	8,832	73	61	21	73,416
Urea	565	2,794	2,039	12,110	2,509	1,789	14,029	8,706	17,221	2,834	64,596
Other chemical nitrogen products	387	1,670	535	2,810	644	962	298	656	2,078	642	10,682
Total nitrogen	**31,742**	**134,487**	**462,913**	**423,152**	**494,818**	**314,985**	**314,668**	**126,741**	**382,066**	**52,475**	**2,738,047**
Available P_2O_5											
MIXTURES: N-P-K	35,852	187,695	431,758	508,691	226,064	209,347	99,266	7,480	36,111	14,488	1,756,752
N-P	7	66	136	18,172	67,730	1,381	12,614	12,365	19,705	651	132,827
P-K	4,435	21,044	27,410	32,908	14,436	31,715	9,818	24	882	1,065	143,737
MATERIALS:											
Amonium phosphate: 11-48	[1]	1,185	54	8,431	25,112	1	2,298	7,565	10,790	666	56,102
Ammonium phosphate 13-39	0	1	0	39	8,933	7	7,223	1,633	2,257	0	20,093
Ammonium phosphate sulfate: 16-20	0	0	0	265	20,659	20	20,255	12,530	23,706	112	77,547
Ammonium phosphate nitrate: 27-14	0	0	10	18	1,103	486	0	820	1,111	0	3,548
Basic slag	0	0	1,068	0	0	5,328	213	0	0	0	6,609
Bonemeal: raw and steamed	257	825	524	288	54	91	51	6	326	33	2,455
Calcium metaphosphate	1	288	860	3,046	7,749	7,144	155	112	32	0	19,387
Diammonium phosphate: 21-53	2	59	359	2,452	3,834	1,575	591	5,632	1,655	450	16,609
Natural organics	544	1,092	842	1,816	730	81	183	269	4,955	6	10,518
Phosphate rock and colloidal phosphate	14	227	757	14,131	3,718	455	672	2	14	96	20,086
Phosphoric acid	0	19	0	191	32	0	2,552	6,654	7,715	0	17,163
Potassium products	17	[1]	5	[1]	0	0	0	0	0	0	22
Superphosphate: 22% and under	6,139	13,431	8,434	11,117	8,554	17,462	10,305	4,328	22,597	189	102,556
Superphosphate: over 22%	32	1,354	877	38,782	68,276	5,287	20,518	37,646	9,908	2,099	184,779
Other phosphate products	88	0	139	618	0	0	3	0	478	232	1,558
Total available P_2O_5	**47,388**	**227,286**	**473,233**	**640,965**	**456,984**	**280,380**	**186,717**	**97,066**	**142,242**	**20,087**	**2,572,348**
K_2O											
MIXTURES: N-P-K	35,790	172,867	468,105	477,259	180,589	203,268	68,882	3,495	28,746	25,392	1,664,393
P-K	6,016	24,646	44,037	44,938	13,167	32,995	9,655	20	771	1,549	177,794
N-K	0	30	34,676	55	[1]	981	241	0	464	8,164	44,611
MATERIALS:											
Lime-potash mixtures	0	2	1,103	0	0	392	0	0	0	0	1,497
Manure salts	0	0	71	0	1	0	262	0	0	0	334
Natural organics	233	465	416	369	112	26	74	58	8,482	1	10,236
Potassium chloride	696	3,710	20,277	118,211	28,199	30,103	22,855	445	5,064	5,213	234,773
Potassium magnesium sulfate	9	297	621	635	55	302	13	100	170	23	2,225
Potassium nitrate	44	6	58	3	0	0	0	0	0	0	111
Potassium sodium nitrate	0	33	2,181	34	0	234	142	0	0	0	2,624
Potassium sulfate	95	833	2,197	1,483	1,526	3,094	71	592	3,407	553	13,851
Other potassium products	210	3	511	4	17	0	0	0	23	102	870
Total K_2O	**43,093**	**202,892**	**574,253**	**642,991**	**223,666**	**271,395**	**102,195**	**4,710**	**47,127**	**40,997**	**2,153,319**
GRAND TOTAL: N, avail. P_2O_5, K_2O	**122,223**	**564,665**	**1,510,399**	**1,707,108**	**1,175,468**	**866,760**	**603,580**	**228,517**	**571,435**	**113,559**	**7,463,714**

[1] Less than 0.5 tons.

The International Scene

HOLLAND

N production up

In comparison with 1959 nitrogen production in Holland rose by 6 per cent, to 229,000 tons, from which about 955,000 tons of fertilizers were manufactured. The State Mines accounted for 52 per cent of the total Dutch nitrogen production. By the end of 1959 a unit was brought into production for cracking methane separated from coke oven gas. It gives a wider choice of base materials for ammonia and saving in base material costs. Urea production went up by over 20 per cent from 68,000 tons in 1959 to 82,000 tons in the year under review. Plans for a further increase in the capacity of the urea plant are now being carried out. For various countries the nitrogen content of calcium ammonium nitrate, the most important nitrogenous fertilizer, was raised from 20.5 per cent to 23 per cent.

INDIA

Makes varied news

India's ambitious program to boost output of nitrogen fertilizer to one million tons annually by 1965-66, a key target in the current third five-year plan, may fall short of its objective.

A survey of India's chemical fertilizer industry by the U. S. Embassy in New Delhi notes that the public sector's original target of 800,000 tons of capacity by 1965-66 has been cut back to 729,000 tons.

While the five-year plan goal of 1 million tons remained unchanged, the short-fall in planned public sector output, according to latest revisions of the plan, will be made up by fertilizer companies in the private sector.

But the Embassy notes that private enterprises' entry into large-scale nitrogenous fertilizer production has been delayed by such difficulties as the acquisition of licenses and the conclusion of arrangements for foreign capital participation. The private sector of the industry, it added, "presently lags behind public sector planning."

* * *

K. C. Reddy, Union Minister for Commerce and Industry addressing the Fertilizer Association of India, assured that, if needed, import of fertilizer would be allowed, within the limits of the foreign exchange available.

Addressing the sixth annual general meeting of the Association in New Delhi, Mr. Reddy declared that the importance of fertilizers in India was obvious in view of the fact that the yield per acre was among the lowest in the world. Since it was not possible to increase the acreage under cultivation, it was necessary to persuade farmers to use fertilizers to raise production if the country was to achieve self-sufficiency in food and cash crops.

* * *

Without formally increasing the third Five Year Plan target for the production of nitrogenous fertilizers —for which enough capacity has already been licensed—the Government may issue licenses for the establishment of three more fertilizer plants, it is learnt.

One of the three new plants is likely to be in the public sector and it will be located near the newly discovered oilfields in Gujarat. It will be based on naphtha.

The other two plants will also be based on naphtha, but they will be in the private sector. Mangalore and Tuticorin are the most likely sites for these two plants.

* * *

The outlook for the Indian jute industry has improved substantially with the advent of a bumper crop of raw jute, according to William A. Nugent, representative in North America for the Indian Jute Mills Association of Calcutta. This improvement in the jute industry's fortunes, he added, is of great significance to India's foreign exchange position as well as to U.S. consumers of burlap as a packaging material and industrial textile.

Jute goods exports account for some 40% of India's dollar earnings and this foreign exchange income is counted upon to play an important role in the success of India's third "Five Year Plan." Similarly, U. S. industry and agriculture normally consume over 850 million yards of burlap annually plus some 100 million yards of carpet backing for the floor covering industry.

The acute shortage of raw jute which has plagued the Calcutta mills for over a year was a result of drought conditions in India and Pakistan.

The past two months, according to Mr. Nugent, have been one of the worst periods of crisis in the 100 year history of the jute industry, but in spite of these conditions, he said, the extraordinary effort of the industry leaders to cope with the crisis has avoided a physical shortage of jute fabrics for American consumers.

Current estimates of this year's jute crop place the yield for India at 7.1 million bales and that for Pakistan at about 7.5 million bales. With this prospect of a bumper crop, raw jute prices have come down more than 50% from a high earlier this year.

With the return of more attractive prices, however, and the reduction of inventories which has taken place, U.S. consumers, according to Mr. Nugent, are showing renewed interest in jute goods so that some of this year's loss in consumption should be made up in the remaining months of the year.

ITALY

Farm demand falling off

Output of phosphatic materials continued to decline in 1959, following a trend that began in 1956 and that has been influenced by decreased demand from farmers. Production of nitrogenous fertilizers rose substantially in 1959, stimulated by increased exports. Potash salts also were produced in greater volume, and output is expected to rise markedly in 1961 following installation of new mining and processing facilities to exploit potash salts from Sicilian deposits. Fertilizer mixtures had the highest percentage increase, owing to high demand for products in this group.

Official data on capacity of Italian plants are not available, but reliable estimates of annual capacity are (million metric tons): Phosphatic, 2.6; nitrogenous, 3.4; mixed and compound, 1.3; and potash salts, mostly potassium sulfate, 0.2. The latter is the capacity of the new Montecatini plant at Campofranco.

In September 1960, the Comitato Intermisteriale Prezzi (CIP), a Government agency that sets maximum selling prices for fertilizers, decided to reduce prices by from 2.5 percent for phosphatic to 8-9 percent for nitrogenous, mixed, and compound.

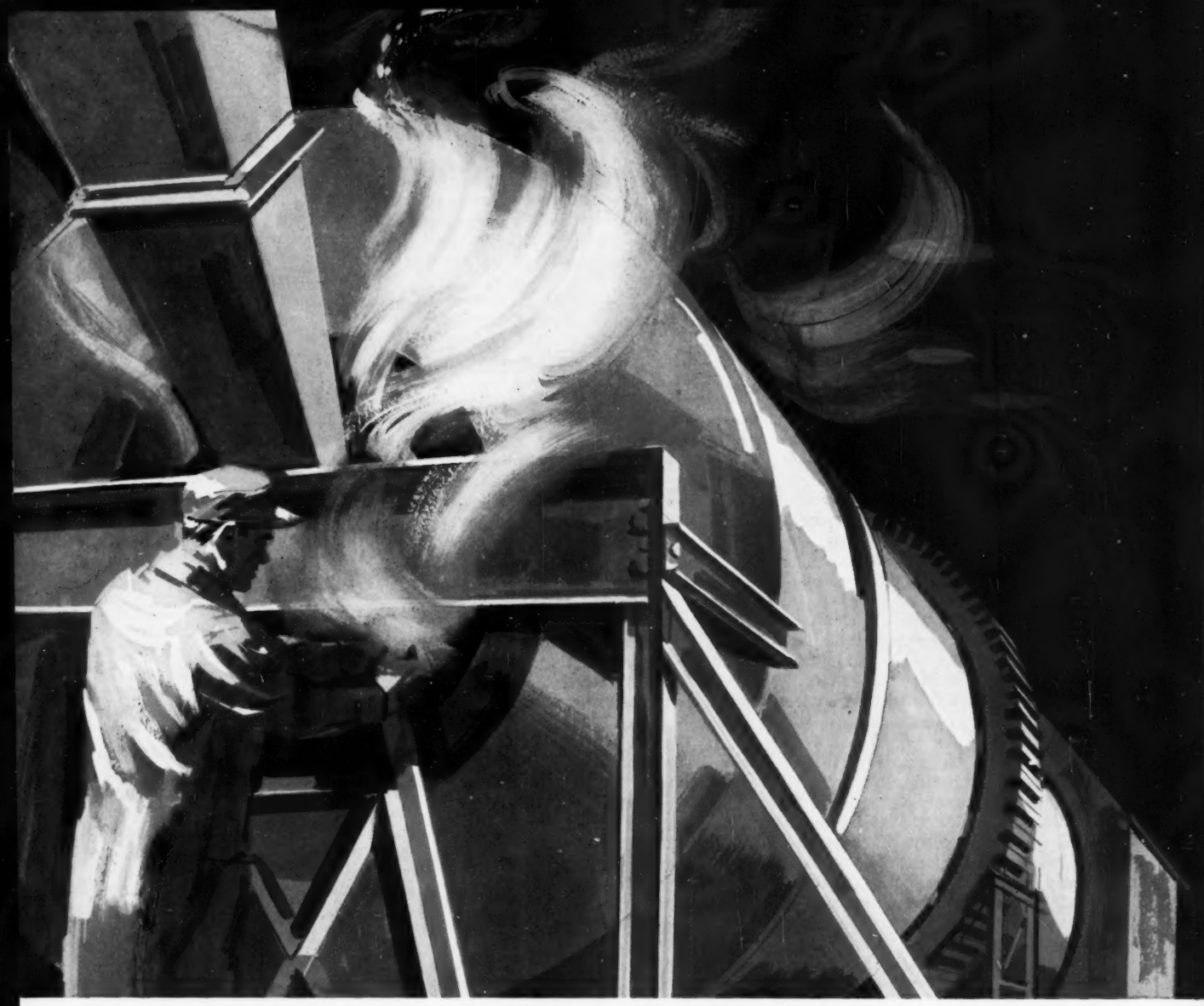
JAPAN

Too many farmers!

Too many farmers is one of Japan's major economic headaches.

Unlike most political leaders, the Japanese Prime Minister had the courage to say that within 10 years, about 60% of those now farming would be working in factories and what's more, the Prime Minister felt this was a good thing.

The Japanese government has be-



Texaco can help you stop loss of fertilizer raw materials

Many people in management believe that nitrogen loss in ammoniation, over-analysis, bag breakage, loading and unloading, amounts to only 4 or 5%.

Actually, only the best-run plants have such low losses. More typically, they may approach 15%.

These are findings by Texaco technical experts who help tighten procedures in fertilizer plants as part of the over-all Texaco "Stop Loss" program. For instance, nitrogen losses – including losses of ammonia, N_2 and oxides of nitrogen – are found to be a prime problem in making mixed fertilizer. Our people can advise on proper methods of mixing to avoid losses during ammoniation . . . on plant processes such as crushing, screening, drying, cooling. You can also tap our experts' knowledge of transportation and unloading equipment, storage and handling.

Would you like to have a Texaco man visit you for a look at your possible losses? The service is free. Write to Texaco Inc., *Petrochemical Sales Division,* 135 East 42nd Street, New York 17, N. Y., or 332 South Michigan Avenue, Chicago, Illinois. Dept. CF-41

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TEXACO
PETROCHEMICALS

AQUA AMMONIA, ANHYDROUS AMMONIA, NITROGEN SOLUTIONS, DIISOBUTYLENE, CUMENE, BENZENE, TOLUENE, ODORLESS MINERAL SPIRITS, NAPHTHENIC ACID, PROPYLENE TETRAMER AND RUST INHIBITORS.

gun a program of retraining farmers and helping them to leave the farm for the factory.

They are leaving right now at a rate of 300,000 to 400,000 every year. This rate is expected to drastically increase in the years ahead.

The dynamic, expanding Japanese economy, however, will have to take men and women from the farm and put them into factories, for the farm will be the main source of labor in the growing industrialization.

Mechanization and fertilizer have combined to shoot up farm production tremendously. Rice production in Japan today is more than is needed now and equal to the needs of 1970.

Economists feel the size of farms must be expanded to take full advantage of farm machinery and new agricultural techniques. This, in turn, means fewer farmers.

Today there are 16.5 million farmers in Japan, each one having an average of about two acres. Even without added government incentive to leave the farm, the agriculture population has been falling sharply as the Japanese economy booms.

PAKISTAN

Steps up Urea to farms

In the early years of independence, the total supply of fertilizers in Pakistan was about 14 thousand tons,—nearly 9 thousand tons reserved for tea gardens in East Pakistan. In 1952-53, less than 3 thousand tons of fertilizers were available for all the other crops in East Pakistan, the total supply rising to 66,479 tons in 1960-61. Under the Second Plan, fertilizer consumption in the Province is expected to increase to 257,000 tons. So far, Ammonium Sulphate has been the principal fertilizer in use, irrespective of its suitability for different soils and crops, but, as a result of experimental trials carried out since 1957 under the Rapid Soil Fertility Survey Scheme with the assistance of an FAO expert, the pattern of fertilizer use is to be widely different. Under the Plan, East Pakistan will have only 10,000 tons of Ammonium Sulphate but 117,000 tons of Urea, 120,000 tons of Superphosphates and 10,000 tons of Muriate of Potash. Thus, an ampler and more judicious use of artificial fertilizers will lead to a substantial increase in the average per-acre yield. A most significant event in the history of agriculture in East Pakistan is the establishment of the gas-fed fertilizer factory at Fenchuganj, which is expected, by November, to go into production and supply nitrogenous fertilizers at prices low enough to render unnecessary the present subsidy.

PORTUGAL

N plants coming to production

One of the sectors of industrial production to which the Portuguese plans of development have given greatest attention is nitrogenous fertilizers. The aim is to provide agriculture with the fertilizers it needs in sufficient quantity and at lower prices.

In the First Development Plan (1953-58) a specially strong impetus was given to industry through undertakings carried out by various firms. One of them, the "Amoniaco Portugues" ("Portuguese Ammonia") company, enlarged its installations at Estarreja as part of the Plan, to increase production capacity to over 110,000 tons of ammonium sulphate per year. The same happened at the Barreiro factory belonging to the "Uniao Fabril do Azoto" ("Nitrogen Manufacturing Company").

The plant for the output of calcium cyanamide at Canas de Senhorim was also extended. This plant belongs to the "Companhia Portuguesa de Fornos Electricos" ("Portuguese Electrical Furnaces Co.") and now has an annual output capacity of 15,000 tons.

In the course of the First Development Plan, the Economic Council decided to widen the programme through the setting up of two new enterprises. These are both included in the Second Development Plan, at present being carried out, which also includes completion of a phase of production of new types of nitrogenous fertilizers. The two new firms are "Sociedade Portuguesa de Petroquimica ("Portuguese Petro-chemistry Co.") and "Nitratos de Portugal" ("Portuguese Nitrates Co.")

During 1961 a start will be made on production in these two industrial units, the former installed at Cabo Ruivo and the latter at Alverca.

In the constitution of the company "Nitratos de Portugal," the growing increase in consumption of nitro-ammoniacal fertilizers was borne in mind. This was brought about by the existence in Portugal of much land subject to very great, unpredictable variations of rainfall. The result is often a scarcity of water at the time when plants most need it. This makes it necessary for the nitrogen they need for food to be supplied in such a way that it may be as independent as possible of the presence of water for assimilation. This aim is attained in fact by the utilization of fertilizers containing nitrogen, to be produced by the "Nitratos de Portugal" company in sufficient quantity to supply the market without shortage and to reduce importation to a minimum, with a consequent saving of foreign currency.

The company has set up its installations near Alverca, between the Lisbon-Oporto national highway and the northern railway line and near the Tagus. The principal product will be a calcareous dilution of ammonium nitrate of a minimum rate of 20.5% of nitrogen. The annual production will be about 100,000 tons. It was also to turn out 15,000 tons yearly of calcium nitrate, at a rate of 15.5% of nitrogen and also 10,000 tons per annum of concentrated nitric acid, this being consumed in increasing quantities by national industry, where it has many different uses.

PERU

Fertilizer use climbs

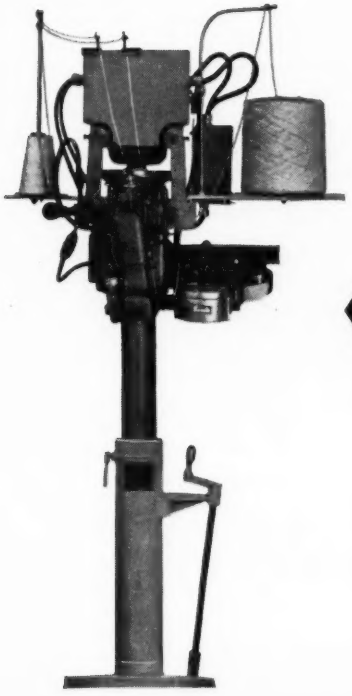
Negotiations reportedly are under way between Peru and Japan for exploiting huge phosphate rock deposits in Peru's Sechura desert.

Total consumption of fertilizers in Peru is estimated at 304,000 metric tons in 1960, up 35 percent over 1959. Production and imports of chemical fertilizers have been expanding. Guano, formerly the principal fertilizer used, accounted for only 37 percent of the 1960 total. Output of superphosphate, ammonium sulfate, and ammonium nitrate amounted to 22,000 tons, 10,000 tons, and 12,000 tons, respectively. Imports, largely of nitrogenous materials, totaled 135,838 tons in the first 11 months of 1960. The United States accounted for approximately 16 percent of the imports, but its share has been declining because of generally higher prices than for comparable materials from Germany, Netherlands, and Belgium. Growing demand for fertilizers, largely from cotton and sugar growers, is expected to be supplied increasingly by domestic production in the future. A 110-percent increase in output of ammonium sulfate and ammonium nitrate to 46,000 tons and a 64-percent increase in superphosphate to 36,000 tons are scheduled in 1961. Expanded ammonium sulfate capacity and urea production are planned.

SPAIN

Ammonium sulphate production up

Ammonium sulphate production in Spain reached slightly more than 280,000 tons during 1960, according to a report in "Chemiker-Zeitung." Production in 1959 was 226,820 tons, as compared with 178,860 tons in 1958.



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Use it to print product codes, specifications, data for shipping and handling identification, commodity analyses, product packaging date. And you can take it from there.

Mounted on a Bemis sewing pedestal, the Bag Top Printer shown at left imprints a bag as it is being sewn closed. In operation, an attendant simply leads the edge of the bag into the printing guide. The bag is then coded. An actuator starts the sewing head to sew the bag. The thread is automatically cut when the bag leaves the sewing head.

Power-driven, the Bag Top Printer uses a pre-inked roll that eliminates fluid inks, solvents, etc. Type, on a rotary print wheel, can be quickly changed.

For more information how a Bag Top Printer can help increase the efficiency of your packaging operation, just get in touch with us.

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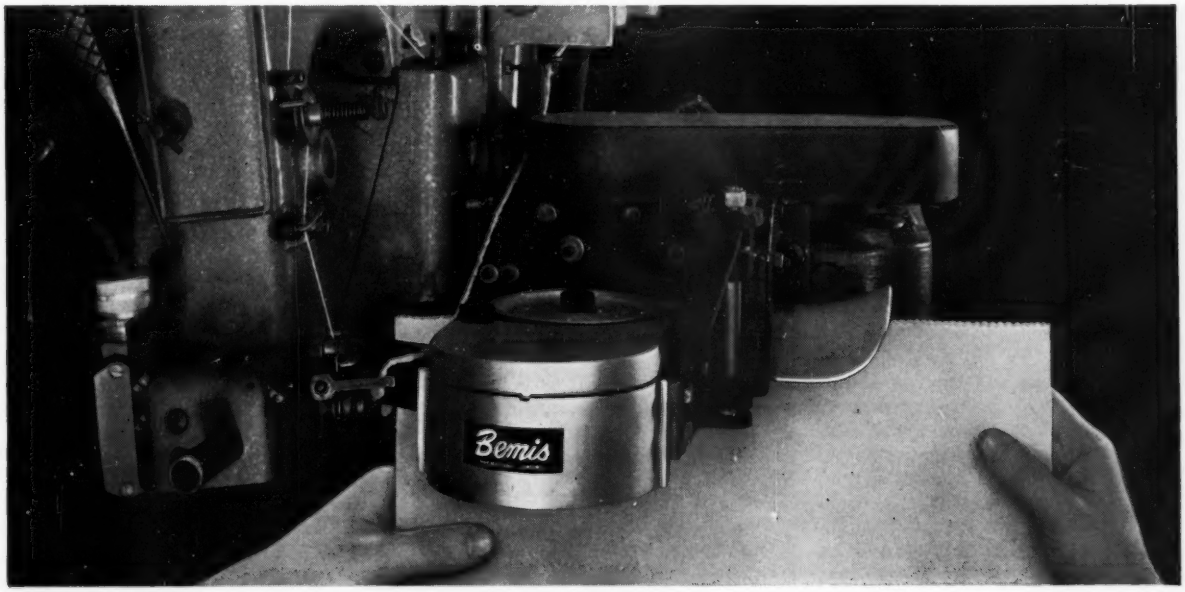

CHANGES

Escambia to Make Urea Solutions

Escambia Chemical Corporation will begin manufacturing urea solutions January 1, it has been announced by R. U. Haslanger, president.

A new plant is nearing completion at Pace, Florida, near Pensacola, where Escambia's other products are produced.

The plant will have a rated capacity of 20,000 tons per year and the entire output will be used in Escambia's Bay-Sol ammoniating solutions or in Ammo-Nite direct application solutions.

Mr. Haslanger said Escambia has no plans at present for manufacturing solid urea.

Dorr-Oliver Sets Up Brazil Subsidiary

In order to provide expanded services to its many customers in Brazil, a new subsidiary corporation has been formed by Dorr-Oliver Incorporated, Stamford, Connecticut. Known officially as Sociedade Tecnica, Industrial e Comercial Dorr-Oliver (Brazil) Ltda., the new company has its headquarters at Rua 15 de Novembro 164, 3° andar, Sao Paulo.

Dorr-Oliver was formerly represented in Brazil by Sociedade Tecnica e Comercial Serva Ribeiro, S. A., whose president, Dr. Vicente Ribeiro, is a partner in Dorr-Oliver (Brazil) Ltda.

Managing director of the new firm is Paul Mourier-Petersen, who was previously responsible for operations in Mexico and Central America for Dorr-Oliver Incorporated.

Rex, Inc., to Produce Liquid Fertilizer Equipment

Rex, Incorporated, of Huntsville, Alabama, has recently acquired a 40,000 sq. ft. manufacturing plant on Decatur Road where the company will manufacture and assemble tanks and other liquid fertilizer equipment, announces John P. Dail, vice president in charge of Sales.

Rex, Inc., will produce and market a complete line of both trailer and tractor-mounted anhydrous ammonia applicators and storage, transport, and application equipment for liquid fertilizer. Their liquid fertilizer equipment will be made with aluminum, steel, stainless steel and fibreglass tanks. A choice of materials and spacings for the boom and a choice of tool bars and knives for sub-surface application will be available to nation-wide customers.

H. J. Baker Distributor For Brockville Chemicals

H. J. Baker & Bro., Inc., with headquarters in New York, has announced it has been named exclusive distributor in the United States for Brockville Chemicals Limited of Maitland, Ontario.

At the same time, H. J. Baker & Bro., (Canada) Ltd. of Montreal, was appointed exclusive distributor for Brockville in Canada.

The announcement follows activation of a new plant by Brockville at Maitland, resulting in a major expansion of Canada's chemical industry for 1961. The plant, which went on stream in September, produces 360 tons of ammonia a day for the manufacture of nitrogen solutions, anhydrous ammonia and ammonium nitrate.

H. J. Baker & Bro. will distribute the company's "Bull's Eye" brand of products in the U.S. by truck, railroad tank car, and via the St. Lawrence Seaway.

John Deere Chemical Moves Offices to Tulsa

The executive and sales offices of John Deere Chemical Company were moved from Pryor to Tulsa, Oklahoma, September 5.

W. W. Yeandle, president, announced the new offices are now located in the Ramada Building at 50th and Yale Streets, Tulsa 14, Oklahoma. Departments effected by the move include administrative, sales accounting, traffic and advertising.

John Deere Chemical Company manufactures fertilizer and feed grade urea, ammonia and urea-ammonia solutions at the Pryor plant. The Tulsa plant produces a complete line of ammonium phosphate fertilizers.

TVA Consolidates Ag and Chem Activities

Consolidation of the Tennessee Valley Authority's agricultural and chemical activities at Muscle Shoals, Alabama, has now been completed, according to Lewis B. Nelson, manager of TVA's Office of Agricultural and Chemical Development.

The consolidation will enable TVA to develop to its fullest potential a closely coordinated, well rounded program in fertilizer research and development, education and demonstration, Dr. Nelson stated.

Monsanto to Tailor Fertilizers at Local Levels

Monsanto Chemical Company's Agricultural Chemicals Division will move to increase its share of the market for industrial and agricultural ammonium nitrate through an expanded network of local facilities that formulate material to customer specification.

A. Milton Sprague, manager of the Agricultural division's plant at El Dorado, Ark., has been named to administer this program as manager of custom-formulation facilities, effective October 1. He will continue to report to the division's manufacturing director.

In his new position, Sprague will work with marketing personnel in assisting customers to set up and operate fertilizer bulk blending plants. Positioned in key market areas, these facilities will provide users a ready supply of material tailored to suit their needs, according to Monsanto.

Succeeding Mr. Sprague as manager of the El Dorado plant will be Thomas S. Hostetter, now assistant plant manager.

Flexicraft-Wrapture, Inc. New Packaging Supplier

Spencer Chemical Company announced September 1 the formation of a single company from two of the suppliers of flexible packaging materials which it recently acquired. The consolidation brings Flexicraft Industries, Inc., 3670 Dyre Avenue, New York City and Wrapture, Inc., 133-30 32nd Avenue, Flushing, New York, together as a single firm to be known as Flexicraft-Wrapture, Inc., Subsidiary of Spencer Chemical Company.

Coastal Absorbs Arkansas Plant Food

The stockholders of the Arkansas Plant Food Company, fertilizer manufacturing and distributing firm affiliated with the Arkansas Farm Bureau Federation, have approved the transfer of the company's fixed assets in exchange for stock of same value in the Coastal Chemical Company of Yazoo City, Miss. Under this new arrangement Coastal Chemical Company will continue operation of the local plant, which is located at 801 N. Palm Street.

These two companies have been

precision-sized granular potash

✔ Dust-free ✔ Uniform
✔ Won't crumble, settle-out in shipment!

In response to customer demand, IMC engineers have perfected a new, compact, precision-sized granular potash! Each granule is specially compacted and processed to produce superior cohesive strength — to prevent granule crumbling or breakdown in shipment, in mixing and handling.

This new potash material is precision manufactured to a new, improved screen size. It's dust-free, flows easily, won't bridge or pack. Delivering 60% K_2O minimum, this high-analysis potash is ideally suited for direct application . . . and contributes substantially to a more uniform mixed-goods formula. Result: you get superior physical characteristics *without* effecting chemical properties in your fertilizers or in the soil.

New IMC granular potash specification sheets and product samples are now available to you through your IMC representative.

Look to IMC for new and improved raw materials and for Full Orbit Services — designed to help you consolidate and *extend* your profit position.

A COMPLETE LINE OF IMC RAW MATERIALS

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cooperating previously. The Arkansas Plant Food Company has held stock in the Coastal firm during the last three years. The North Little Rock company has used Coastal plant food material in manufacturing fertilizers and has also sold Coastal mixed fertilizers.

"Fluid Bed" Ammoniating Process

What is claimed to be a superior process for ammoniating superphosphate has been developed in Czechoslovakia by J. Trozan, V. Jara and V. Vanecek. It is described as a fluid bed process.

The superphosphate is fluidized by a current of ammonia and air. It is claimed that the ammonia absorption rate in the fluid layer is much higher than in conventional units, and that both initial and operating costs of the reactor are lower.

Other claimed advantages are that it avoids such undesirable characteristics as stickiness, flocculation and high acidity in the superphosphate.

Robbins & Myers Form New Airtrol Division

A. W. McGregor, president of Robbins & Myers, Inc., has announced the formation of a new division of the company to be known as the Airtrol Division. The new division will be headquartered at Springfield, Ohio.

Airtrol will specialize in the design, production, and marketing of unit type collectors for the control of dusts and mists encountered in industrial and commercial operations.

The new Airtrol line will include two types of dust collector units—fabric filter type and kinetic cyclone type. These units will be suitable for controlling all common industrial dusts and will clear the air of particles as small as sub-micron sizes.

Airtrol products will be nationally distributed by approximately 40 manufacturers' representatives, many of whom have already been appointed. The Robbins & Myers Company of Canada, Ltd., Brantford, Ontario, will serve as the Canadian outlet.

New machinery and production facilities for the Airtrol Division are currently being readied in Springfield for early Fall production schedules.

E. J. Stone, sales manager of the company's Propellair Division, has been assigned managership duties for the new Airtrol Division. M. I. Dorfan, dust control authority, has been given the responsibility for performance and testing of the new line.

Ardco New Manufacturing Roto-Werl Spreader

Ardco, West Point, Pa., has announced that the Roto-Werl Spreader is now solely manufactured and distributed by them under the name 'Ardco Roto-Werl Spreader.'

Toney Mascaro, president of Ardco, designer and holder of all patents on the Ardco Roto-Werl Spreader has been active in the turf industry for the past 20 years. One of the original founders of West Point Products, Mr. Mascaro retired from that company six years ago and later reentered the industry as vice president of the Hatfield Roto-Werl Spreader Corp. Now devoting his full time and efforts with Ardco in further research and development of spreaders, he is assisted by two former associates, Miss Dorothe G. Hemmerle, vice president of Sales and Advertising, and Clifford Martin in charge of manufacturing and technical research.

The Ardco Roto-Werl Spreader is designed for applying the many new types of free flowing granular and pelleted seeds, fertilizers, insecticides and herbicides and is also used in winter to spread rock salt, calcium chloride and other chemical mixtures to melt ice and snow on roads, parking areas, etc.

Novo Reorganizes Screening Facilities

Novo Industrial Corporation has announced the transfer of its NoVo sonic vibrating screen manufacturing facilities from Chicago to Philadelphia.

W. A. Romain, Nova president, said the former NoVo division has been replaced by the NoVo Screen Department which will be a part of Mitchell Specialty division.

Mr. Romain said the reorganization was made because Mitchell Specialty's Philadelphia plant offers better facilities for the engineering and manufacture of NoVo screening equipment, used in the fertilizer and other industries.

Sonic screens, recently introduced in this country by Novo Industrial as part of its program to develop more efficient industrial equipment, utilize ultra-high frequencies to vibrate screens instead of the frame as in conventional shifters.

TVA Announces New Credit Policy In Distributing Fertilizer Material

Fertilizer manufacturers and distributors handling fertilizers in the Tennessee Valley Authority's distributor demonstration program may apply for up to 90 days' credit under a new payment policy announced September 27 by TVA. In the past, shipments were made with the understanding that payment was due within 30 days of invoice date.

Under the new credit policy, a one percent price increase will be added on shipments for which credit beyond 30 days is granted. Otherwise, terms remain net for 30 days or one percent discount for payment within 15 days. The 90-day credit will be available annually on shipments made from September 1 through February 28.

The new policy was prompted largely by the fact that extended credit of a formal or informal nature, ranging from 60 days to 6 months, together with continually increasing accounts receivable, has become widespread in the fertilizer industry, TVA explained. In a recent survey, many companies indicated that their accounts receivable were higher last year than at any time in their history.

The venture into more extended credit by TVA was described as an experiment which the Authority hopes will point the way to a more orderly credit situation in the industry. If it serves to formalize credit policy to the extent that firms are not pressed into financially hazardous positions as a result of overextension of credit, the new policy will have served a useful purpose, it was stated.

TVA said, in making the announcement, it recognizes that reasonable credit provisions are important in the fertilizer industry. It cited, for example, a study made by Iowa State University, in cooperation with TVA, which showed that farmers attach considerable importance to credit as a service they want from their fertilizer dealer.

These survey results and the rapid build-up in accounts receivable in recent years convinced TVA of the necessity for offering credit to its distributors on a regulated and sound financial basis for longer periods.

CALIFORNIA

United B & G Company, Santa Barbara, incorporated to produce insecticides and fertilizers by: directors,—Ernest E. Pinkerton, Winifred M. Jaeger, Rosalie D. Broderick. 2500 no-par shares.

FLORIDA

Florida Fertilizer Co., Wauchula, was robbed of checks totalling $1400 as intruders broke out the glass in the front door and struck the safe dial with a heavy instrument—but were not able to open it.

GEORGIA

Monsanto will build at Augusta a new plant to produce fertilizer materials and other chemicals. Construction is due to start next year, with completion scheduled for 1963, according to E. J. Bock, vice president and general manager of the inorganic chemicals division.

IOWA

Monsanto will get under way this month on construction of their new 200 daily tons ammonia facility at Muscatine, which is scheduled for completion in about 12 months. Work is now in progress on a 15,000 ton terminal on the same 500 acre tract, which will be supplied for the present from Monsanto plants at El Dorado and Luling. Natural gas will come, over a special 3-mile pipeline connecting with the Natural Gas Pipeline Co. of America which cross at this point on their way from Texas to the mid-West.

Joseph W. Gillespie (see Industry People) will be in charge of advance preparations and operation of the terminal.

* * *

Rockwell Farmers Cooperative Society, Rockwell, last month held an open house to celebrate the completion of "the first cooperatively owned fertilizer blending and mixing plant in North Iowa." Orchids to the ladies and free soil testing for the gentlemen were among the features.

The plant is modern, with a new system of dry blending. This includes a liquid Aldrin injector, which helps stamp out the root worm problem of that area. One man operation permits the blending of 5 basic ingredients, by the push of a button,—and the entire blending is actuated by a 4½ horsepower motor!

The 24 x 40 foot plant, with its 36 x 140 foot warehouse, has a 750 ton capacity. Bagged and bulk fertilizer will be available, as is the service of a 4-ton, 45-foot wide spreader.

* * *

Lowden Fertilizer Co., Lowden, has been organized by Ruprecht Lumber Co. of the same city. It will offer bagged and bulk plant foods, custom-mixed. A new plant and warehouse with 800 ton capacity will be built soon. Henry L. Ruprecht, a partner in the lumber concern, will be vice-president and general manager of the new operation.

MINNESOTA

Midland Cooperative Inc., Minneapolis, has built at Mountain Lake a new $45,000 blending plant on land leased from the Chicago and North Western Railroad. The structure is 50 by 80 feet, of concrete and timber. The plant will require only 2 people, making custom fertilizers from pelletized material shipped in by rail. The product will be distributed by truck.

MISSISSIPPI

Coastal Chemical Corporation, according to W. B. Dunwoody of Yazoo City, general operations manager, has awarded contracts for a $5,000,000 expansion program that will double the plant's present N production.

Work on the expansion construction is to begin "late this year or early 1962" with completion expected in November or December of 1962.

The Girdler Corporation of Louisville, Ky., will construct ammonia compression and ammonia synthesis units. J. F. Pritchard Company of Kansas City, Mo., will construct gas-reforming and gas-purification units.

When completed the expanded facilities will have a daily production basis of 400 tons, compared to the present 200 tons daily.

Coastal Chemical Corporation, sponsored by Mississippi Chemical of Yazoo City, was located in the Bayou Casotte industrial area four years ago. Originally the high analysis fertilizer plant was planned as an investment of $8 million but by the time production began $14 million had been invested in the facility. The current expansion program will give Coastal Chemical an investment total of about $19 million.

* * *

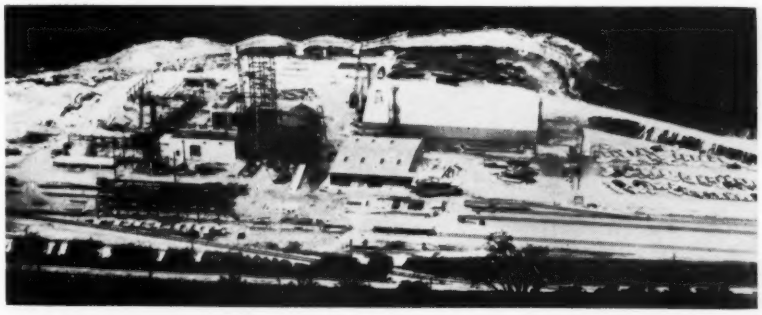
Dixie Fertilizer stockholders were given 60 days last month to come up with a workable plan. The Meridian concern, which declared bankruptcy in order to gain time to collect money owed it, and which showed assets 3½ times liabilities (See Map, September) is under the direction of permanent trustee L. L. McAllister. He has pointed out that the choice is between disposal of the assets or the raising of $750,000 in cash to pay off $250,000 in debts and have enough capital to operate.

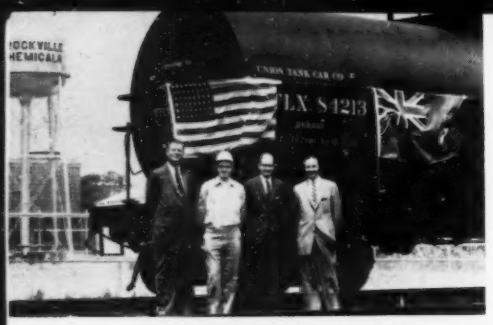
NEW JERSEY

The Terre Co., fertilizer mixer of Totowa, suffered a $200,000 fire at its recently consolidated plant there. The flames were fed by fertilizer,

NITRATE OF POTASH PLANT NEARS COMPLETION

Construction of the new $7,000,000 plant of Southwest Potash Corporation in Vicksburg, Mississippi for the production of nitrate of potash and byproduct chlorine is progressing on schedule. Test and break-in operations will take place late this year as originally planned. The Vicksburg plant marks Southwest's initial venture into chemical production. It will produce nitrate of potash using a new process developed by the company and will, for the first time, make agricultural grade nitrate of potash available at prices in the range of agricultural chemicals.





BROCKVILLE NAMES H. J. BAKER U. S. DISTRIBUTOR

Departure of first United States-bound tank car of nitrogen solutions produced by Brockville Chemicals Limited's new plant at Maitland, Ontario, is marked by company representatives. At left is J. Morse Smith of H. J. Baker & Bro., Inc., which announced September 27 it has been named exclusive U. S. distributor for the Canadian firm. With him are (left to right) J. Texhon, production manager, Dr. C. A. Vandendries, executive vice president, and B. T. Johnson, manager of sales and development, all of Brockville Chemicals.

pesticides, seed, hay. The cinder-block and wood building was an expanded reconstruction of a similar Terre plant which burned down 6 years ago.

OKLAHOMA

Modern Fertilizer Co., Altus, has been incorporated for $50,000 by Clayton Tinney, C. T. Polston and Hatton McMahan.

COLOMBIA

Abonos Colombianos, S. A., Cartagena, has gone into production. The $11,000,000 operation plans an aggressive program of promotion to introduce their product to the Colombian consumer.

INDIA

Sindri operations have improved substantially, according to our latest reports from New Delhi, averaging over the past 8 months 840 daily metric tons. Most of the troubles which have haunted this operation seem now to be corrected.

Nangal has stepped up its production to ⅔ of its rated capacity, which is 1,176 daily tons of calcium ammonium nitrate. Full production awaits delivery of an electric power load of 164,000 KW, which cannot be brought in from Bhakra until Spring.

* * *

Multan has been going through test operations of various units, and only minor modification seem to be indicated in the ammonium nitrate area. The nitric acid plant results indicated need for replacement of some automatic controls. Progress in the ammonia section is reportedly slow. The urea crystalization unit tested satisfactory, except for the air supply.

* * *

Trombay preparatory work has made good progress. A contract has been awarded Chemical Construction Corp. for $19,790,000 for equipment of the ammonia, urea and nitric plants. Tenders are under consideration or have been issued for the nitro-phosphate plant and the sulphuric acid plant.

A $30,000,000 agreement has been signed with the U.S. Development Loan Fund to meet the foreign exchange requirements of the project.

IRELAND

The Government plans to underwrite construction of the $22,000,000 N plant, plans for which were shelved two years ago, though Government studies have continued, at Arklow. The plant is to employ 500, and will use as raw material pyrites, from the nearby St. Patrick copper mine, one of the largest in Europe.

ISRAEL

American-Israel Phosphate test drilling has already established the presence of 50,000,000 tons of rock in the Negev desert, in two months of drilling. As drilling results develop, the company plans to start shipment at the rate of 600,000 annual tons, building up to 1,000,000. A flotation plant is planned, with other developments in the offing.

JAMAICA

Jamaica Industrial Development Corp. announced an organic fertilizer plant with a production of 60,000 annual tons, established at Kingston by a group of U.S. Investors, to process the garbage of the island's capital city. The corporate name is Jamaica Organic Fertilizers Ltd.

JORDAN

The Public Works Ministry has announced that Western Knapp Engineering, San Francisco, is to undertake preliminary studies for a $17,000,000 projected potash operation. A pilot plant has already proven successful, and a number of Arab countries are sharing in the raising of capital.

MEXICO

Fertilizantes del Ismo, Vera Cruz, has opened the first of six units of "the most modern fertilizer factory in the world." The present unit is a fertilizer mixer. Those to come include units to produce nitric acid, urea, processed urea, urea crystals, sulphuric acid and phosphoric acid.

PAKISTAN

Karachi, the $53,000,000 natural gas fertilizer plant is expected to be in operation next month. Projected capacity is 117,000 annual tons.

SOUTH AFRICA

Windmill Fertilizers, Durban, are spending 170,000 Rand ($238,000) for the expansion of one of their plants.

SPAIN

The Industrial Agency will build a plant to turn out 45,000 annual tons of N fertilizers, plus 90,000 tons of other chemical products, at Puertollanos.

The same state-owned agency is organizing a company for the exploitation of phosphates in the Spanish Sahara.

SYRIA

USSR is to build at Homs a $28,000,000 plant with a capacity of 110,000 annual tons of ammonium nitrate fertilizer. The first unit is due to start producing 60,000 annual tons in 1965. 1968 is set as the completion date for the remainder.

Cyanamid Opens Agricultural Center

"The farmer's future rests in the hands of research people. Only a steady stream of new products from the laboratories will keep farm producers competitive," said C. D. Siverd, general manager of American Cyanamid Company's Agricultural Division, at the opening of the Cyanamid Agricultural Center September 25. The Center, the most comprehensive privately-owned facility of its kind in the world, is located near Princeton, N. J. on a 640-acre tract.

"With our chemists turning out thousands of new chemicals every year, we must provide adequate facilities for testing their effects on laboratory animals, crops, and livestock. By the time a chemical is accepted by the Food and Drug Administration and the U. S. Department of Agriculture, it has gone through hundreds of tests to insure that it can be used safely and that it does the job farmers expect of it."

Architect's drawing of Research and Development Building at Cyanamid Agricultural Center.

Now Chief Kay-Two-Oh can take time out to enjoy the Harvest Moon as he listens to the Indian Love Call with his Sweet Sioux — because he knows that it takes more than a moon, or even a medicine man, to bring in a good harvest.

Proper fertilizers are recognized in today's scientific farming methods as essential to producing bumper crops. The Chief is proud that the only business of Pee-Cee-A is supplying potash for these fertilizers. It's gratifying to have helped in the production of a bountiful harvest.

It's also gratifying to the Chief to feel that Pee-Cee-A offers the best service possible. If his scouts can be of service to *you*, let him know!

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P.C.A. SALT of the EARTH RED MURIATE

CARLSBAD, NEW MEXICO "AMERICA'S **CHIEF** SUPPLIER OF POTASH"

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PCA Standard 60% Muriate of Potash
PCA Coarse 60% Muriate of Potash
PCA Granular 60% Muriate of Potash
Potassium Chloride (99.9% KCL min.)
Sulphate of Potash

HE'S STARTING QUALITY PHOSPHATES YOUR WAY

He operates a high-pressure water gun at Cyanamid's Brewster, Florida, phosphate operation. He's one of several hundred Cyanamid people who mine, process, research, deliver and service phosphatic materials for your acidulation and mixed fertilizer business. These people put Cyanamid's more than 40 years of phosphate experience into products and services you can use.

As the giant dragline dumps just-mined phosphate ore, the operator directs a high-pressure stream of water onto the matrix to break it down to an easily-manageable slurry. The slurry collects in a "well" and is pumped through a pipeline to the washer plant. Slurry can be pumped efficiently over great distances, and thus helps make possible the manufacture of quality phosphate products in volume at reasonable cost.

Services you can use

Traffic Service: Cyanamid traffic specialists are ready to route and ship your orders without delays. Their knowledge can save you money, and can make your operation run even more efficiently.

Technical Service: Cyanamid's staff of technical experts are constantly at your service. Make your formulation and production problems theirs. That's their job.

Sales Service: Cyanamid sales representatives are available to work with and for you in expanding present markets or in establishing new markets.

Products you can use

Cyanamid's phosphate business is the mining and manufacturing of the highest quality products for your mixed fertilizer requirements.

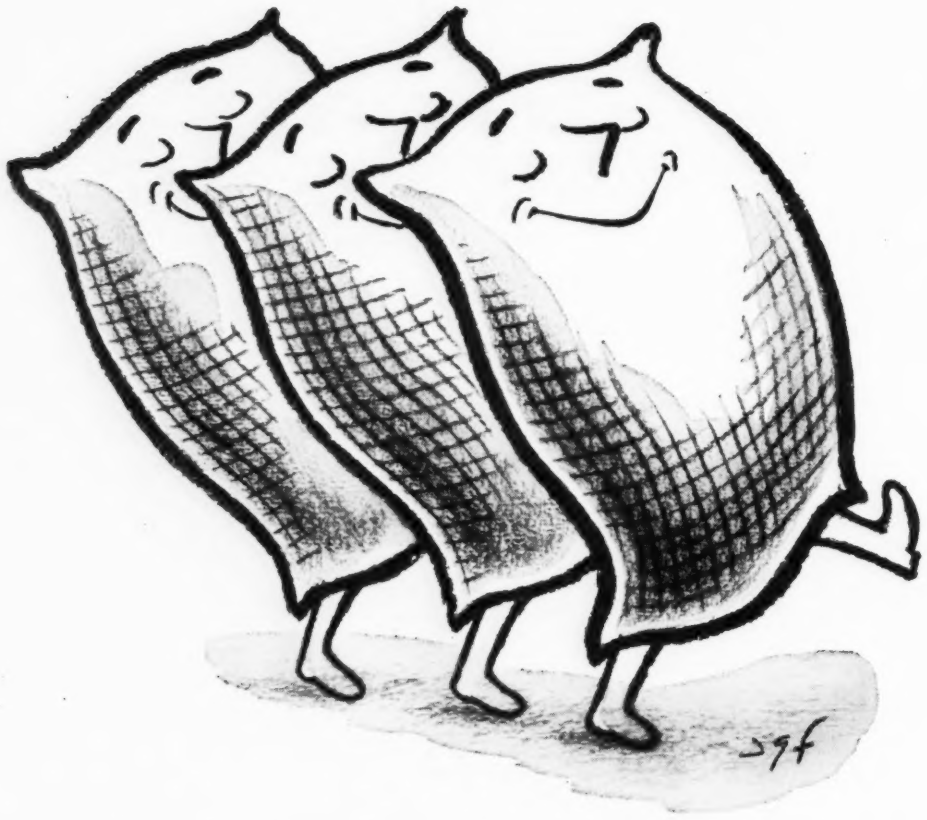
- Florida Natural Phosphate Rock
- TREBO-PHOS® — Triple Superphosphate
- Phosphoric acid—an economical source of P_2O_5 for high-analysis fertilizers.

American Cyanamid Company, Agricultural Div., Princeton, New Jersey. *®TREBO-PHOS is American Cyanamid Company's trademark for its triple superphosphate.*

CYANAMID

PHOSPHATE PRODUCTS

CYANAMID SERVES THE MAN WHO MAKES A BUSINESS OF AGRICULTURE



Here's Burlap... coming to work on the farm!

Burlap comes to *stay*...because Burlap always finds a lot of jobs to do around the farm. As the song says,"old Burlap never dies ...it only wears away!" But before it does, it proves that it saves on space, because Burlap bags stack better. And it saves on waste, because it keeps breakage down. *Bag in Burlap!*

THE BURLAP COUNCIL

122 E. 42nd Street, New York 17, N.Y.

PEOPLE in the INDUSTRY

American Cyanamid

James F. Bourland has been appointed assistant general manager of American Cyanamid Company's Agricultural Division, it was announced by Wilbur G. Malcolm, board chairman and chief executive officer.

Formerly general manager of Cyanamid's Central Research Division, Dr. Bourland will make his headquarters in the company's new agricultural center at Princeton, N.J.

Dr. Bourland joined Cyanamid in 1941; he became assistant general manager of the Research Division in 1957 and was appointed general manager the following year.

Southern Nitrogen

James W. "Jim" Garrett is newly appointed south Alabama sales representative for all product lines of Southern Nitrogen Company. Prior to coming with Southern Nitrogen, he was employed for 4 years by the Georgia and Florida Railroad in freight solicitation in south Georgia, north Florida, and Alabama. Before this he was associated with the Atlantic Coast Line Railroad for 4 years.

James H. "Jim" Mancil is newly appointed south Georgia direct application nitrogen sales representative for Southern Nitrogen.

He was formerly employed by J. I. Case Company as sales representative. Before this, he served in sales promotion for J. I. Case Company.

Joy

John B. Booth has been named manager of the Atlanta office of Western Precipitation Division of Joy Manufacturing Company according to P. W. Zilliacus general sales manager of the division

Mr. Booth has been with Western Precipitation for three years and most recently was in charge of sales in Southern California. In his new assignment he will be responsible for sales of all types of dust collection equipment made by the company.

Smith-Douglass

J. J. Pointer has been appointed assistant to the vice president of the Chemical division and Farm Fertilizer sales manager for the Southeast and Southwest, president W. R. Ashburn of Smith-Douglass Company, has announced.

In his new responsibilities, Mr. Pointer will head the Smith-Douglass fertilizer sales organization in the states of Virginia, North and South Carolina, Texas, Oklahoma, Louisiana and Kansas, reporting to J. H. Culpepper, vice president for fertilizer products.

As assistant to vice president R. S. Rydell of the company's chemical division, he will supervise the administration of Smith-Douglass operations at Texas City, Texas, including coordinating fertilizer production with domestic and export distribution; supervise nitrogen, phosphoric acid, and sulphuric acid sales; and coordinate functions between Smith-Douglass' fertilizer and chemical divisions.

Mr. Pointer joined Smith-Douglass in 1939.

CSC

Jack D. Shirley has joined the Agricultural Chemicals department of Commercial Solvents Corporation it was announced by Loy Everett, sales manager of the department.

Shirley

Mr. Shirley was previously associated with Spencer-Kellogg & Sons, Inc. For 10 years he was an agricultural salesman for Swift & Company in Missouri.

Mr. Shirley will service CSC accounts in a four-state area comprising Missouri, Iowa, Kansas, and Nebraska, making his headquarters at the Company's St. Louis, Mo. office.

Armour

Personnel changes affecting Armour Agricultural Chemical Company operations in Columbus, Ga., and Cincinnati, Ohio, have been announced by H. Vise Miller, vice president and general manager of the firm's Fertilizer division.

At Columbus, Oscar N. Carmichael has been named assistant division manager, while Robert A. Cannon was appointed division credit manager. In the Cincinnati move, the company named Harold S. Rose as assistant division manager.

Mr. Carmichael joined Armour in 1951; Mr. Cannon in 1959; Mr. Rose in 1957.

International Ore

International Ore & Fertilizer Corporation announces the appointment of G. D. Grossman as manager of its Latin-American Division.

Mr. Grossman is presently opening Interore's new offices in Rio de Janerio, Brazil.

A graduate of the School of Foreign Service of Georgetown Univesity, Mr. Grossman was formerly vice-president of Cia Cubana de Avacion. Until the recent nationalization by the Castro regime, he was a director and vice-president of Cia Litografica de la Habana, S. A.

Raymond Bag

Raymond Bag Corporation announces the appointment of Frank Jones to the company's sales staff.

Jones

Mr. Jones has spent many years in the multiwall bag industry and was formerly associated with the First Packaging Corporation where he directed sales activities in Louisiana, Mississippi, and parts of Arkansas. He will make his headquarters in Monroe, Louisiana.

Texas Gulf

Gino P. Giusti, assistant to the president of Texas Gulf Sulphur Company, will serve also as manager of market research, it was announced by C. O. Stephens, president.

After joining Texas Gulf early in 1958, Dr. Giusti served two years in the market area. He was appointed assistant to the president in 1960 and has conducted studies in corporate structure and management.

U S Borax

Appointment of R. E. Kendall to the newly-created position of Canadian project manager of United States Borax & Chemical Corporation is announced by Dr. D. S. Taylor, vice president in charge of the company's technical department.

Mr. Kendall, formerly engineering manager at the firm's Boron, Calif., plant, will be headquartered in Saskatoon, Saskatchewan, where U. S. Borax has been investigating potash permits held since 1957.

C. L. Friedmann succeeds Mr. Kendall. Mr. Friedmann joined U. S. Borax in June, 1960, as senior process engineer. Previously, he had been associated with Titanium Metals Corporation of America at Henderson, Nevada.

Wheelabrator Corp.

Don H. Taylor has joined Wheelabrator Corporation, Dust and Fume Control division, Mishawaka, Indiana, as a regional engineer and has been assigned to a territory in northern Ohio and Michigan, including the cities of Cleveland and Detroit. His headquarters have been established at Wheelabrator's regional office in Cleveland.

Prior to joining Wheelabrator Mr. Taylor was a mechanical engineer in the Plant Layout Section of the Ford Motor Company's Cleveland Foundry, Brook Park, Ohio, specializing in foundry and plant ventilation.

Central Farmers

At the annual board of directors and shareholders' meeting of Central Farmers Fertilizer Company on September 14, 1961 the members elected E. V. Stevenson chairman of the board of directors and Norval Ellefson vice-chairman. They replace D. A. Williams and E. O. Johnston, chairman and vice-chairman respectively who asked not to be considered for re-election. Both men remain on the board. Both Messrs. Stevenson and Ellefson have served on the board and executive committee for several years.

Freeport Sulphur

Robert C. Hills has been elected president of Freeport Sulphur Company, it was announced by Langbourne M. Williams, chairman of the board. He succeeds Charles A. Wight, who became vice-chairman of the board.

Mr. Hills has been a director and executive vice-president of Freeport since 1955. He joined the company in 1934 as an assistant chemist at its Grande Ecaille sulphur mine in Louisiana. He was named assistant to the president in 1947, and elected a vice-president in 1950.

Swift & Co.

The Agricultural Chemical division of Swift & Company has appointed R. W. Finch district manager for industrial chemical sales, with jurisdiction over the western part of the Midwest and the Plains states. His headquarters will be at St. Joseph, Mo. He has been with the company since 1934.

Finch

Struble

Boyd

Succeeding Mr. Finch at St. Joseph is H. Edward Struble, who started with Swift in 1953.

J. G. Boyd has been named manager of Swift's Agricultural Chemical Division at Greensboro, N. C. He succeeds W. H. Parker, who has been with the company for more than 48 years. Mr. Boyd joined Swift & Company in 1938.

General Chemical Division

The appointment of William E. Houghton as manager of market surveys of Allied Chemical's General Chemical Division is announced by Actor H. Patton, director of product development. He will be headquartered at General's research and administration center in Morris Township, New Jersey. He has been with the division 28 years.

Lummus

Dr. Samuel D. Koonce, of 225 North Monroe Street, Ridgewood, N. J., has been named to the newly-created position of manager of commercial development for The Lummus Company, Ralph E. Wise, vice president and director of sales, has announced.

Hardinge

H. DeForest Hardinge was appointed vice president of Hardinge Company, Incorporated and Hardinge Manufacturing Company during a recent board of directors' meeting.

Since joining the company in 1956, Mr. Hardinge has devoted his attention to company finance, personnel management, and company policy.

Monsanto

Monsanto Chemical Company's agricultural chemicals division announced Sept. 25 its ammonia plant to be built at Muscatine, Iowa (see Map), will be managed by Joseph W. Gillespie, maintenance superintendent for the division's manufacturing facility at Luling, La.

Effective Nov. 1, Gillespie will transfer to Muscatine with responsibility for the manufacturing department's advance preparations necessary to start-up of the facility. He also will supervise operation of the 15,000-ton ammonia terminal now being completed.

Further appointments to staff the new plant will be made next spring, according to Robert R. Rumer, manufacturing director for the division. He said that the plant will have a total work force of approximately 40.

Succeeding Mr. Gillespie as maintenance superintendent for the Luling plant is William R. Robirds, now engineering supervisor for the ethylene plant at Monsanto's Texas City manufacturing complex.

Ortho

M. W. Choate, Central California district manager for Ortho Division, California Chemical Company, has announced appointment of William J. Rivers as an Ortho agricultural sales representative for the Watsonville area.

W. J. Majure, Great Lakes district manager for Ortho, has announced appointment of Richard W. Brooks as sales representative for the Marion, Ohio, area, and Rocky Ferrell as a representative for the Southern Ohio area.

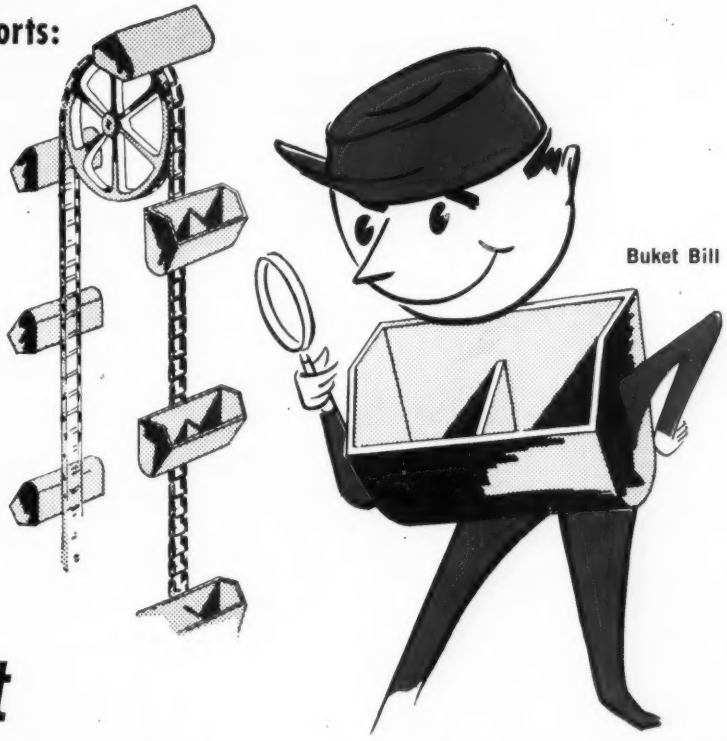
R. C. Yapp, Ortho Midwest district manager, California Chemical Company, has announced the following appointments of sales representatives:

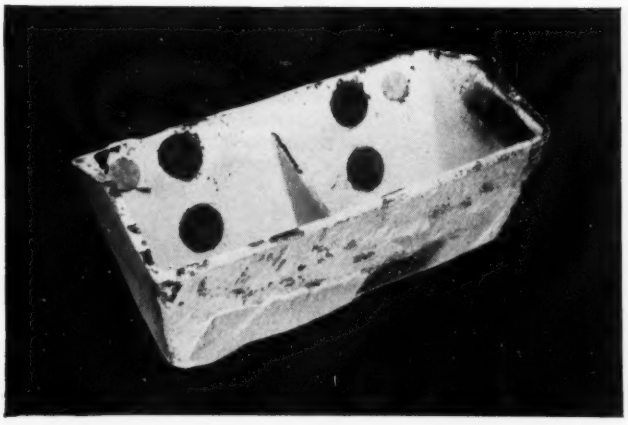
Paul E. Hagen, territorial representative for central Wisconsin; Frank W. Pelley, for southeast Minnesota; Lester J. Tesch, in the Wilmer, Minnesota, area; Robert M. Gulbranson, for southwest Minnesota; David O. Chenault, to cover western Kansas; Charles A. Reed, for southeast Kansas; Johnny C. Burke, in northeast Missouri; Henry A. Bendorf, for northeast Iowa; James A. Forgey, to cover southwest Missouri; Bryce Abrams, for southwest Wisconsin, and Charles A. Zuber, for northeast Nebraska.

Walter E. Swartz has been appointed field agronomist with Ortho Division in the New York and New England States, district manager R. T. Wallace has announced.

The Farmers Fertilizer Co. Reports:

"Ton after ton of corrosive fertilizer *and this bucket still needs no cleaning or replacement"*





This is a Style H 13 x 6 DURA-BUKET after extended use at the Farmers Fertilizer Co., Columbus, Ohio. It's clean, crack-free and undamaged by corrosive chemicals.

"Our plastic DURA-BUKETS have been in operation for quite some time and show no signs of cracking, abrasion or build-up," says this progressive fertilizer manufacturer. Here's **why:**

100% plastic Style H DURA-BUKETS are self-cleaning. Slick walls and rounded corners prevent fertilizer build-up. DURA-BUKETS **cannot** rust or corrode. Soft, resilient plastic "rolls with the punch" to resist abrasion. DURA-BUKETS are lighter, too, for extended chain life.

In case after case, actual performance proves that where caking and corrosion are problems, the new Style H plastic DURA-BUKET is the cost-saving solution.

NOW! AT LAST!

Put an end to bucket cleaning, frequent replacement and costly downtime. Switch to new Style H plastic DURA-BUKETS and start putting more profit into your fertilizer production.

Write today about your elevator problem. Our bucket specialists will promptly supply you with help and ideas.

Dura-Buket

DIVISION

NATIONAL OATS COMPANY

EAST ST. LOUIS, ILLINOIS

SAFETY

Southeastern Safety School Held In Wilmington, N. Carolina

Regional School Leads Off 1961 Series, Sets Format for Other Regional Programs

The Southeastern Safety School for accident prevention in fertilizer plants was held at Wilmington, N. C.'s Cape Fear Hotel, August 24-25, and was attended by 59 students, largest enrollment to date (not included are speakers and others interested who attended).

The school's chief instructor was Emil Chanlett, Professor, School of Public Health, University of North Carolina, Chapel Hill E. O. Burroughs Jr., F. S. Royster Guano Co., Norfolk, and W. M. Shaw, Industrial Safety Inspector, N. C. Department of Labor, Wilmington, were the School's director and associate director. W. C. "Billy" Creel, Safety Director, N. C. Department of Labor, Raleigh, was "anchor man" and program planner.

Curtis A. Cox, vice president, Virginia Carolina Chemical Corp., Richmond, told of management's changing viewpoint toward safety. Management's attitude traditionally has been one of disorganization — when a fatal accident occurred, management's reaction was shock and sadness over the loss of a valued employee but the accident itself was regarded as just one of those things. But today, he said, this has been changed. Management is interested in a safety program and willing and ready to support a program and accept it as part of their operation. Safety attitudes by management are reflected in employee attitude and better production. Today machinery is installed and equipped with safety factors in mind. Management screens their safety supervisors to be sure they have the qualifications for the job. No longer is this a haphazard assignment. When management realized the dividends safety paid to employees and their families and to the company, and in good public relations, reduced insurance costs, etc., they were ready to go all out.

Top: Group gathers at Wrightsville Beach for a demonstration on different types of fire and use of proper fire-fighting equipment

Center: Marshall Petersen, Fire Prevention Specialist, National Safety Council, Chicago, and Emil Chanlett, Professor University of North Carolina, School of Sanitary Engineering, Chapel Hill.

Below: Ed Burroughs, Jr., Manager, Insurance Dept., F. S. Royster Guano Co., Norfolk; A. J. Barnhill, F. S. Royster Guano Co., Wilmington; R. C. Shackleford, Virginia-Carolina Chemical Corp., Wilmington, and V. P. Marsh, Smith-Douglass Co., Inc., Norfolk.

Billy Creel presented the true story of accident costs through a series of practical questions and answers. Each question was directed to the audience until the right answer was given. The questions and answers served to highlight major safety factors as a basis for beginning a safety program.

Emil Chanlett reviewed a step-by-step program for in-plant safety. A good safety record indicates overall good operating practices,—when you do the job correctly it is done safely. The supervisor's responsibility for safety covers the people who work in it, the plant itself, and production in that plant. He must instruct each work method, and how to properly and safely handle all plant equipment. He must recognize and praise the worker for good work, correct the bad worker — it may be he just doesn't understand just how his job should be handled so that it is done the best way and the safe way.

Marshall E. Petersen, fire prevention specialist, National Safety Council, Chicago, told how fires start—12 ways in all—and that each day 100 plants in the country are damaged by fire, some of those that are destroyed by fire are closed for good. He recommended covering fire extinguishers with polyethylene bags to keep clean and bright—otherwise they get covered with dust and fertilizer, become the color of the walls and are hard to see. This can be very important in case of fire.

O. Franklyn Griffith, Jr., safety representative, N. C. Industrial Commission, Winston-Salem, said that fire prevention was a matter of education, demonstration and training people to make them aware of fire hazards and how to cope with fire. Without using knowledge with wisdom you have no prevention. In fact, he said, most plants

have no organized method of fire fighting and when emergency arises what is done is frequently worse than doing nothing. More likely than not it's every man for himself. The greatest opposition to a proper safety program, he thinks, is management's opposition because of cost. You can't have a successful group training without a receptive attitude so have it on company time.

Ed Burroughs showed slide of hazardous situations in plants and pointed out the accident making factors that exist—such as open fan without guard; crawling in around drive chain to grease—if switch is pulled while man is there tragedy results; simple things like the bottom rung (or maybe two) off a ladder that somehow just doesn't get fixed but continues to be used.

The first day of the meeting closed with a demonstration on Wrightsville Beach by Southern Oxygen Company of Greensboro, of the different kinds of extinguishers to use for different kinds of fires. This was followed by a dinner at Marina, also on the beach.

The second day's session opened with brief talks by a panel of experts, including Hugh S. Surles, Jr., Planter's Cotton Oil & Fertilizer Co., Rocky Mount; C. F. Ireland, Southern Nitrogen Co., Savannah; W. F. "Red" Combs, Smith-Douglass Co., Norfolk; Ernie Cain, Greensboro, and Jim Berry, Hopewell, both with Allied Chemical Corp.

Hugh Surles talked on the hazards of ammonium nitrate; C. F. Ireland—ammonia; Red Combs—sulphuric acid; Ernie Cain—ammoniate solutions; Jim Berry-nitrogen solutions for direct application. All subjects were ably presented and filled with safe handling facts on each material.

"Discussion 66"—next on the program—proved highly interesting to the students. Separated into groups of 6, each group asked questions of the others and in turn were asked questions. The answers were thoroughly discussed around each table and the best answer given in reply to the question. This part of the program was so successful that they ran out of time and didn't get to all of the questions.

A "school graduation luncheon" wound up the meeting and certificates were presented to each student.

Pictures from Southeastern Safety School

1. W. C. Creel, Safety Director, North Carolina Dept. of Labor, Raleigh; Gaither Newnam, Smith-Douglass Co., Inc., Norfolk.

2. S. F. Alexander, Swift & Co.'s Wilmington plant, tells of a case of gas asphyxiation, how the man was given the old arm movement respiration which didn't work and then mouth to mouth respiration was tried which did work; and the man's life was saved.

3. Curtis Cox, Virginia Carolina Chemical Corp., Richmond; Gaither Newnam; A. E. Burnette, F. S. Royster Guano Co., Wilmington.

4. Speakers: W. F. Combs, Smith-Douglass Co., Norfolk; Ernie Cain, Allied Chemical Corp., Greensboro; Hugh S. Surles, Jr., Planters Cotton Oil and Fertilizer Co., Rocky Mount; Jim Berry, Allied Chemical Corp., Hopewell; and C. F. Ireland, Southern Nitrogen Co., Savannah.

5. Stanton L. Blalock, North Carolina Dept. of Labor; Walter W. Harrison, F. S. Royster Guano Co., Spartanburg; and M. K. Brown, Robertson Chemical Corp., Statesville, N. C.

6. Anthony C. Truitt, John Ulmer, and Warren K. Simmons, all with Southern Nitrogen Co.

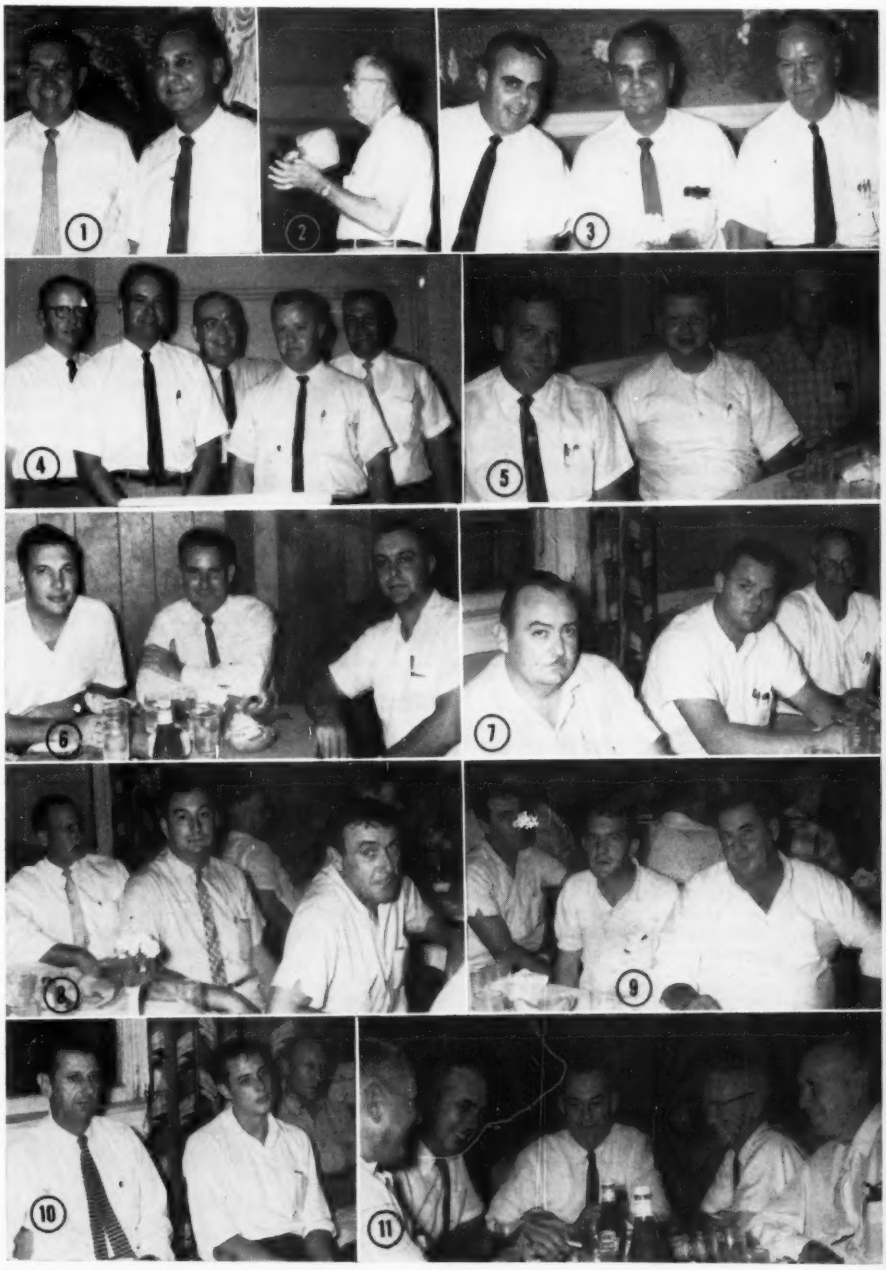
7. V. F. Bailey, Norfolk, and E. R. Caps, Money Point, Va., both with F. S. Royster Guano Co., and F. J. Hatley, Smith-Douglass Co., Wilmington.

8. O. E. Gibson, Dixie Guano Co., Laurinburg, S. C.; T. W. Gore, Jr., Wilmington, and Harvey L. Jeffords, Charlotte, both with F. S. Royster Guano Co.

9. Harvey Jeffords; W. C. Johnson, Smith-Douglass Co., Wilmington, and J. D. Wright, Planters Phosphate and Fertilizer Co., Charleston.

10. Morris C. Arnold, Macon, Ga.; M. J. Jones, Athens, Ga., and William M. Vaughn, Jr., Lynchburg, Va., all with F. R. Royster Guano Co.

11. C. G. Ireland, Southern Nitrogen Co.; Robert S. Griffin, Contentnea Guano Co., Wilson; W. M. Bethune, Lewis P. Sorrell and Frank Crane, all with the North Carolina Department of Labor.



Meeting recently in San Francisco to make plans for the 1961 "Far West Safety School for Accident Prevention in the Fertilizer Industry" were, left to right, Dr. Richard B. Bahme, Western director, National Plant Food Institute, San Francisco; Eugene Schacht, California Chemical Company, San Francisco; J. B. Sturgess, Collier Carbon and Chemical Corp., Los Angeles; and Sidney Bierly, general manager, California Fertilizer Association, Sacramento. Sturgess will direct this year's School and will be assisted by Schacht. The Western office of the National Plant Food Institute and the California Fertilizer Association are jointly sponsoring the 1961 School which will be held October 23 and 24 at the Hacienda Motel, Fresno, Calif.

FAR WEST SAFETY SCHOOL

The fourth annual Far West Fertilizer Safety School will be conducted on October 23 and 24, 1961, at the Hacienda Hotel, Fresno, it was announced by Jack B. Sturgess, school director. The school is sponsored by the National Plant Food Institute and the California Fertilizer Association.

Mr. Sturgess, who is supervisor, Chemical Sales Service, Collier Carbon & Chemical Corporation, Los Angeles, invites all persons concerned with safety program in fertilizer plants and warehouses to enroll. The fee is $20.00 for each enrollee, which includes the complete binder of course outline, two luncheon tickets and one banquet ticket. Enrollment blanks and the program are available on request of the California Fertilizer Association, 719 K Street, Sacramento 14, California.

Hugo Riemer, president of the United States Borax and Chemical Corporation, Los Angeles, will be the featured speaker on the banquet program. His subject will be "Importance of Safety to Management."

Another feature will be a paper on the Economics of Fertilizer Industry Safety, by an insurance company engineer. Sturgess said that almost unbelievable savings in workmen's compensation insurance premiums have been effected by many concerns after establishing supervised safety programs in their plants.

Other features will be Fundamentals of Accident Prevention, Transportation Safety for the Fertilizer Industry, Fertilizer Plant Equipment Safety, Fire Prevention in Fertilizer Plants, Safety in Fertilizer Plant Operations, Fertilizer Plant Warehousekeeping, and Use of Chemical Fertilizers as Fire Retardants.

A period of school participation on "Problems We Would Like to Have Solved" will invite outlines of practical problems, with several groups participating in efforts to solve them.

PROGRAM

Fertilizer Section, National Safety Council

Chicago, October 16-17

MONDAY AFTERNOON
Third Floor, Washington Room, Pick Congress Hotel

Ansel I. Raney, Safety Director, Phillips Chemical Co., Bartlesville, Oklahoma—general chairman, presiding.

2:00—Annual Report.

2:15—Report of Nominating Committee. Elmer Perrine, Director of Technical Services, Nitrogen Division, Allied Chemical Corporation, New York City.

2:20—Election of 1961-62 Officers.

2:30—Demonstration of Communimeter. "Accident Prevention through Effective Communications." L. K. Jonas, Chief Supervisory Development Division—Texas Engineering Extension Service, Texas A & M, College Station, Texas.

3:15—Discussion.

3:30—"Strains in the Fertilizer Industry." Joseph M. Bosworth, M. D., Division Medical Director, Liberty Mutual Insurance Company, Atlanta, Georgia.

4:15—Discussion.

TUESDAY LUNCHEON AND AFTERNOON

Presiding—Gaither T. Newnam, Director of Insurance, Labor Relations and Safety, Smith-Douglass Company, Inc., Norfolk, Virginia.

12:00—Luncheon—Speakers:

J. S. Queener, Manager Safety and Fire Protection Division, Employee Relations Department, E. I. Du Pont de Nemours and Company, Inc., Wilmington, Delaware, "Why You Should Have an Off-The-Job Safety Program."

C. E. Alexander, Director of Public Relations, Illinois Farm Supply Company, Bloomington, Illinois. 'Management's Role in Accident Prevention."

2:00—Presiding—General Chairman Elect.

2:05—"How to Eliminate the Risk of Overhangs in Fertilizer Piles." T. A. Bayley, Plant Superintendent, American Agricultural Chemical Company, Cleveland, Ohio.

3:00—"How to Use the 'Serious Injury Index' as a Measurement of an Accident Prevention Program." O. C. Haier, Manager of Safety and Workmen's Compensation, The Standard Oil Company, Cleveland, Ohio.

3:40—Electrical and Fire Demonstration. "The Chemistry of Fire and Static Electricity."—A. E. Carter, Fire Marshal, E. I. Du Pont de Nemours and Company, Kinston, N. C.

Safe Tank Entry New Pamphlet from MCA

An eight-page pamphlet on recommended safe practices and procedures for entering tanks and other enclosed spaces is now available from the Manufacturing Chemists' Association, Inc.

The publication, 10th in the Association's Safety Guide series, emphasizes that hazards inherent in tank entry can be avoided or overcome by following three basic principles. They are:

"Establish a definite system of pre-planning for tank entry and a worker instruction program;

"Prepare the vessel for entry by physically isolating it, cleaning it to remove contaminants, and testing it to insure absence of such contaminants;

"Use a formal permit system requiring written authorization for entry to be issued only after the supervisor in charge is satisfied personally with tank preparation, precautions to be taken, personal protective equipment to be used, and procedures to be followed."

Responsibility for safety, both at the time of entry and during the entire operation rests with the supervisor, the pamphlet states. Such responsibility also covers conditions of work for contractors' employees and workmen from other divisions as well as for his own men, it points out.

Among the hazards commonly present, the MCA publication states, are: Toxic vapors in fatal concentrations; flammable gases with potential fire or explosion; lack of oxygen, causing asphyxiation; electric shock from portable lights, tools, or associated electrical equipment; injury from mechanical equipment such as mixers, conveyors, etc., inadvertently activated; bodily injury from direct contact with corrosives or dermatitis-producing chemicals; physical hazards such as slipping, falling and falling objects; and burns resulting from accidental opening of a steam valve in a line which has not been blanked off or disconnected.

The pamphlet suggests a sample work permit for employees entering the tank or enclosure and also recommends tools and protective clothing needed by employees.

SG-10 is available from the Manufacturing Chemists' Association, 1825 Connecticut Ave., N.W., Washington 9, D.C. for 30 cents a copy.

Closing Materials Calculator

A handy wallet size reference table for estimating the amount of materials required to close sewn open mouth multiwall bags is now available from St. Regis Paper Company. Called the Closing Materials Calculator, it has been devised by the company's Bag Division as a ready guide for production, materials handling, purchasing, research, and engineering planning personnel. It can be used by most industries which package their products in sewn open mouth multiwall bags.

The calculator lists, for 1000-bag lots, the amount of closing materials which would be required for bags ranging in face width size from 10 inches to over 24 inches. Amounts are given for the following materials: flat or crepe tape; cotton, rayon and bulk rayon threads; and crushed paper filter cord. Also listed are the amounts of carliner which would be required for rail shipment of multiwall packaged goods.

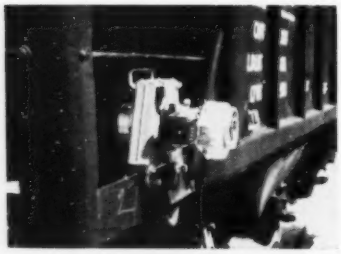
The calculator is available in reasonable quantities by circling number 1 on CF's Information Service card, page 59. (please mark number of calculators desired in margin of reply card.)

Hopper-Car Vibrator

A unique hopper-car vibrator—hand-portable, self-contained, gasoline-operated—that develops a force sufficient to unload an entire car from one location, without manual assistance, has been announced by Martin Engineering Co.

At 3,000 rpm, the CCVG-3000 'Big Shake' vibrator produces an unbalance force of 6,600 lbs., capable of moving such difficult materials as rock phosphate, cement, gravel, coal, ore, etc.

A built-in mounting clamp feature insures secure attachment to any rigid angle. Unit mounts easily and quickly on open or covered cars without cumbersome, expensive auxiliary equipment and is adaptable to all bulk-carrying rolling stock.



One man can perform all unloading operations without getting into or under the car. The unit weighs 77 lbs. Since it requires no external power source, this vibrator is suited to remote-site unloading. None of the usual electrical or air sources are required.

Martin Engineering Co., originators of the Vibrolator line of vibration inducers, offers full-credit return privileges if the CCVG-3000 does not meet customer satisfaction.

Complete 42-page vibration inducer catalog available by circling number 2 on CF's Information Service card, page 59 .

SUPPLIERS
report on
new equipment,
new materials,
new supplies,
new processes
... free literature

Marking, Dating and Coding

A new 4-page brochure which shows a variety of equipment for solving marking, dating and coding problems has been issued by Industrial Marking Equipment Company, Inc.

The new leaflet features a photographic center spread in which these machines are shown and briefly described. Some of the units pictured are: a number of different flexographic imprinting machines for marking cartons, plastics, bricks, etc., case sealer marking attachments, coding devices for packaging machines, printers for multi-wall bags and cartons, imprinting attachments for bag filling machines and many other marking units.

The brochure is available by circling number 3 on CF's Information Service card, page 59.

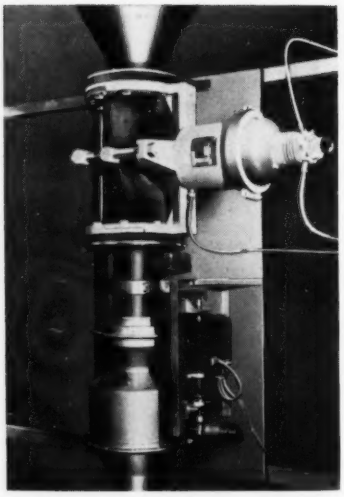
Materials Handling Brochure

A new brochure presenting its full lines of materials handling systems, components, special products and services is announced by Webster Manufacturing, Inc.

The brochure describes systems for unloading, feeding operations, conveying and elevating, parts and package handling, processing and special conveying for handling bulk materials. Applications are in fertilizer and other industries.

The brochure also describes the broad range of components and special products developed by the 85-year-old firm. In addition it outlines Webster's services for engineering, design, steel fabrication, pattern making, foundry-machine shop, chain making and on-site erection of complete installations. Many of Webster's design and manufacturing services are available on a job basis for other manufacturers.

For Bulletin FL-661, circle number 4 on CF's Information Service card, page 59.



Flo-Weight Controller

A continuous weighing system, with automatic control of weight, for dry-flow processes is now available from Industrial Powertronix, Inc. According to the manufacturer, the system offers a guaranteed accuracy of ±1%, low operating cost, easy installation in existing spouting and practically no maintenance. Use of these systems is said to allow complete automation of any dry-flow process or combination dry-flow and liquid process.

The new 'IPI' Flo-Weight Controller is a combination of a pneumatically operated 'pinch' valve and a precision device called an 'IPL' Dry-Flow Meter, which is constantly weighing the dry-flowing material. Any variation in a previously selected flow rate automatically results in a signal from the meter to the pinch-valve controller to correct rate of flow. If desired, flow rate also may be recorded and/or totalized.

Flo-Weight Controllers are available to fit spout sizes from 2" to 14", with capacities from 10 to 3500 lbs. per minute. Overall sizes vary from 18" x 11" x 20" for the 2" spout size to 33" x 24" x 78" for the 14" spout size.

The system is said to be corrosion and abrasion resistant and to have no bends or cavities for build-up of flowing materials. Also, because the system is completely enclosed, the company reports that there is no leaking of even the most dusty materials. Only 115 v., 60-cycle, 3-phase electric power and an air supply of 60 psi is needed for operation.

Additional information may be obtained by circling number 5 on CF's Information Service card, page 59.

Inexpensive Flow Alarm

A new bulletin supplement, just released by Schutte and Koerting Company, describes the company's 'Flo-Eye' Indicator Alarm. The bulletin gives construction and operating details for this new adjustable flow alarm that sells for $50, f.o.b.

For a copy of the new bulletin, circle number 6 on CF's's Information Service card, page 59.

Sealing Heavy-Duty Plastic Bags

A new, stronger and more reliable closure for heavy-duty polyethylene bags has been developed by the Chase Bag Company and is now standard on all Chase open-mouth bags of six-mil or heavier gauge at no extra cost.

Tradenamed Chase-Lok, the closure features a heat seal that extends through four polyethylene plies, including both walls of the bag and a strip of one-inch polyethylene tape folded over the bag bottom.

The new construction was made possible by recent Chase developments in heating sealing techniques and in the extrusion of polyethylene film with optimum heat sealing properties.

Laboratory tests by a major independent plastics producer reveal that the closure is outstanding in both shock impact strength and resistance to delamination. Edge drops and exposure under stress to temperatures of 180°F. produced no seal failure. In field tests, a leading chemical manufacturer reports a net product loss of only two pounds in multiple carload shipments with Chase-Lok bags.

Chase points out that it is also possible to seal the tops of filled bags by the Chase-Lok method, and that tape-heat sealing equipment for this purpose is commercially available. This technique is particularly effective in the packaging of dusty products, since the major strength of the seal is carried between the tape and the outside of the bag wall, where dust contamination is generally not present.

For additional information, circle number 7 on CF's Information Service card, page 59.

Flexible Conveyors

Power-Curve Conveyor Company has released Catalog #567, describing their powered flexible conveyors used to load bags and packages into box cars and trucks. It includes telescoping conveyors, multi-purpose systems, car-loading stackers, mechanical palletizers, in-car palletizing, bag flattening and elevating, sorting and mixing conveyors, etc. Typical floor plans are shown as well as many product photos and an impressive list of installations.

Copies are available by circling number 8 on CF's Information Service card, page 59.

Improved Soil Tester

Features and specifications of the improved RD-B15 Soil Tester are covered in a new brochure just announced by Industrial Instruments, Inc. The compact tester measures total soluble salt in greenhouse and nursery soils by a very simple method which gives the user instantaneous and accurate measurements. Designed to tell when to fertilize, how much to fertilize, and when to leach, the portable unit is an invaluable instrument for growers, colleges and research stations.

The brochure also shows a complete kit, designated Kit RD-300S, which contains the RD-B15 Soil Tester, a dip cell, thermometer, measuring flasks, and a hardwood carrying case.

For complete details, circle number 9 on CF's Information Service card, page 59.

Compact Gas Chromatograph

A complete and precise unit measuring only 8 x 8 x 18 inches, this new Nester and Faust gas chromatograph has been designed especially for inexpensive laboratory use.

According to the manufacturer, excellent qualitative and quantitative results may be obtained by attention to detail.

The unit is complete and may be placed into operation by connecting to helium supply and recorder. If variable temperatures are used, thermocouple is connected to potentiometer for correct temperature on preheater and on column oven. The model will give a full scale response with as little as 2-3 Lambda sample. It's upper temperature limit is 250°-300°C and it can be adapted for use at 0°C or below.

The new bench model has been designed to free more expensive Chromatographs for more complete analysis. It's price of $345 is expected to be especially attractive.

More information on the 'Anakro' Gas Chromatograph can be obtained by circling number 10 on CF's Information Service card, page 59.

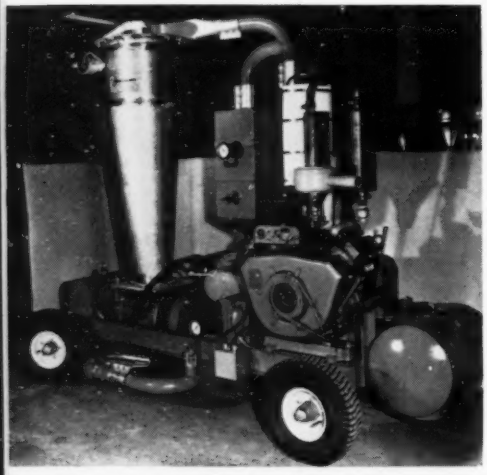
New Liquid Equipment

A multi-purpose unit is the key to a well balanced line of liquid fertilizer and anhydrous ammonia applicators being marketed by Rex, Inc. A quick exchange of the boom for a tool bar makes a sub-surface applicator without need for additional parts. This Series '200' trailer applicator features wide choices of all components best suited to local or specialized needs. Optional metering system offered includes choice of air compressor, ground-drive 'LF' metering pump, or roller pump.

Tanks will be available in steel, aluminum, fibreglass, and for special uses, stainless steel.

More specific details of Series '200' applicators, booms and tool bars are: Booms of a choice of materials including aluminum, stainless steel, nylon or a combination of materials in both wet and dry types and adaptable to 10," 20" and 40" spacings with swaths of 21,' 27' and 30'. Tool bars offered in 3 row (8 foot) length and 5 row (14 foot) length with either swept back or standard injector knives. The '200' trailer frame is of double-arch design with over 30 inches clearance and choice of 14" and 15" rims.

For additional information, circle number 11 on CF's Information Service card, page 59.



Portable Pneumatic Conveyor

A positive and negative pressure portable gas engine driven pneumatic conveying system for transferring granules or powders from bulk cars to trucks or bins or for moving materials from one point to another has been developed by Sprout, Waldron & Co., Inc. The unit is also available with electric motor drive.

For complete details, circle number 12 on CF's Information Service card, page 59.

Marking Polyethylene Bags

A new hot transfer leaf printer which applies sharp, clear, indelible imprints on polyethylene bags has been introduced by Industrial Marking Equipment Company, Inc.

The solenoid-controlled, air-operated unit uses heated metal type and a hot printing head to permanently transfer the thermoplastic die imprint from a roll of tape to the bag.

The automatic leaf feed is completely adjustable as is the heat and dwell control. The ability to regulate the latter to precise temperatures and time helps prevent sealing of the bag during the hot imprinting cycle.

After insertion into the throat of the machine, the bag is automatically positioned by the printer which then imprints a code number, product identification or other information.

Further information on the new leaf printer is available by circling number 13 on CF's Information Service card, page 59.

Liquids and Solids Feeding

B-I-F Industries, manufacturers of equipment and systems for positive control of materials flow, has just released a new comprehensive bulletin on feeding, weighing, blending and proportioning equipment for the controlled feeding of liquids and solids in process industries.

The continuous, accurate and dependable feeding and blending of liquids feature such products as the Proportioneers pumps, for volumetric feeding of toxic, explosive or corrosive liquids and suspensions; the Omega Rotodip for wide-range feeding of slurries, low viscosity or corrosive liquids; the Proportioneers Blendamatic and Two Component Blenders, for continuous, in-line blending of components without intermediate mixing or storage.

Feeding of a wide variety of solid chemicals either volumetrically or gravimetrically feature such products as the Omega compact, screw-type dry feeder for constant-rate feeding; the Omega Table Model Feeders, for low-filling, low-power requirements of pulverized, floodable or granular solids; the Omega Belt Feeders and Weighers for continuous gravimetric feeding of dry solids.

The eight-page, multi-colored bulletin contains descriptive material, photographs, schematics of typical process systems and a listing of industrial systems contained within the broad application range of B-I-F equipment.

For your free copy of Bulletin Ref. No. 4.20-1, circle number 14 on CF's Information Service card, page 59.

Vibrating Screen Literature

Overstrom & Sons, Inc., pioneer manufacturer of vibrating screen equipment, has announced availability of a new unit, the Series 500 Vibrating Screen. Designed especially for lighter-duty screening requirements in chemicals, minerals, food products, agricultural commodities, for sizing, scalping, and de-watering applications, the Series 500 has a lower purchase price, yet it retains all of the basic design and operating characteristics of the larger Overstrom Series 1000 Vibrating Screens. Features include a unitized vibrator cartridge, easy amplitude adjustment, 98% vibration isolation, push-type tapered bearing removal sleeves, and double piston ring grease seals.

Free copies of recently-published descriptive literature are immediately available; for a copy, circle number 15 on CF's Information Service card, page 59.

Fortable Temperature Probe

A new, easy-to-use temperature measuring system, designed primarily for use with granular or powdered materials, has been introduced by Radson Engineering Corporation.

Highly-portable and extremely fast, the system may be used wherever temperatures must be measured in out-of-reach places. Temperatures from 20 to 150° F. can be

measured with exceptional accuracy. Internal mercury batteries normally last up to five years—maintaining accuracy without calibration adjustment.

The Radson Temperature Probe System consists of a temperature meter with shoulder strap; four 3-foot, internally-wired probe sections with threaded ends; and a quick-responding, removable sensing tip. The sensing tip and meter can be connected to any probe section. Extra probe sections are available to increase length beyond the 12 feet normally furnished.

Key element in this low-cost system is a tiny thermister contained in the sensing tip. For permanent or semi-permanent location of the sensing tip when frequent temperature readings must be made—including non-corrosive liquids, 25-foot temperature cables with sensing tips and meter connectors are available.

For full information, circle number 16 on CF's Information Service card, page 59.

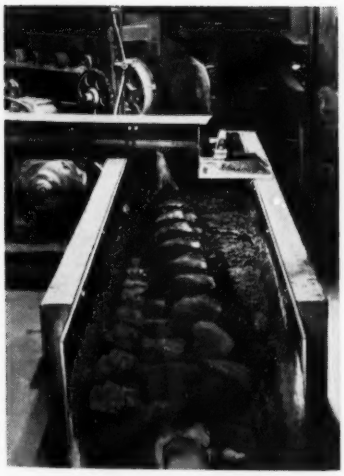
Canned Pump Bulletin

Design and construction features of the 'Electri-Cand' pump which permit efficient and safe handling of 'problem' liquids are presented in new literature released by Allis-Chalmers.

Completely sealed, Electri-Cand pumps require a minimum of space and plumbing. The pumped precious, toxic, volatile or corrosive liquids flow through the motor and serve as a cooling agent and bearing lubricant. Corrosion-resistant sealing cans contain the liquid and protect vital motor components from harmful effects.

The bulletin includes a list of typical solutions (including ammonia —anhydrous and aqua—and nitric, phosphoric and sulfuric acids) successfully handled by Electri-Cand pumps.

Copies of 'Electri-Cand Pumps,' Bulletin 52B8471B, are available by circling number 17 on CF's Information Service card, page 59.



Continuous Mixers

A new line of continuous mixers is now available from Falls Industries, Inc., as a result of their recent acquisition of Anthony Engineering Company.

Fourteen standardized sizes of the Falls Continuous Mixers are available in single shaft and double shaft models to provide a wide range of selection from standards. Also, custom units can be designed to meet precisely the intended application.

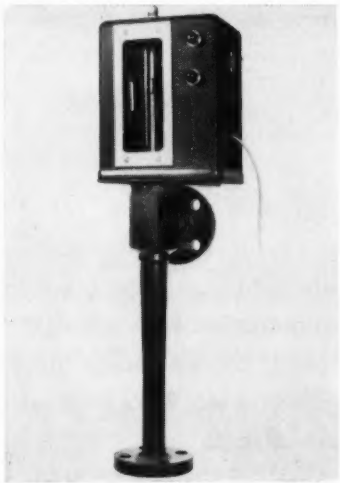
These mixers can handle virtually any mix from basic iron ore treatment to fine chemical powder processing at continuous capacities from 150#/hr. to 100 tons/hr. They can be furnished in carbon steel, stainless, aluminum and alloys. They can be jacketed, and can be manufactured to code.

Among design advances are unique paddle contours, adjustable pitch paddles, minimum dust formation, and a very low level of vibration in operation.

Additional data is available by circling number 18 on CF's Information Service card, page 59.

New Alarm Rotameter

A new metal-tube alarm Rotameter, the Fig. 1900-F-CDA, has just been added to the Schutte and Koerting Co. line of 'variable area' type instruments for the accurate measurement of fluid rate of flow.



Of special interest to users is the space saving design in which the visual indicating element and alarm system are included in one housing. This cuts down on headroom requirements common to previous type designs where tube, visual indicating element, and alarm system were mounted separately, one above the other.

The SK metal-tube alarm Rotameter consists of a standard metal-tube Rotameter for measuring fluid rate of flow and an alarm system. The alarm system includes a magnetic indicator and alarm switches mounted in a weatherproof housing. The unit can be equipped with one or more alarm switches and with 10 amp. relays when these are required.

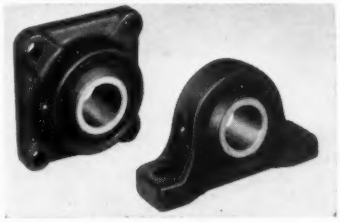
In operation, the alarm switches are set for maximum and minimum flow. When flow is higher or lower than the maximum settings, the switches will activate a signal light, bell, or other alarm device, a 'start-stop' switch, or other control mechanism.

SK Metal-Tube Alarm Rotameters are furnished from stock. For information, circle number 19 on CF's Information Service card, page 59.

Flex-Block Sleeve Bearings

Link-Belt Company has announced availability of self-aligning, self-lubricating Flex-Block sleeve bearings in flanged and pillow block types which solve many difficult bearing problems. These bearings are designed to operate in temperatures up to 1,000 deg. F.; in corrosive and contaminating conditions; in inaccessible locations where lubrication and maintenance are problems; where noise control is important; at slow speeds and even under water.

Their unique construction almost doubles the normal sleeve bearing life. The sleeve bearing cartridge is held in position in the housing by means of a set screw, which, when backed off, allows the cartridge to

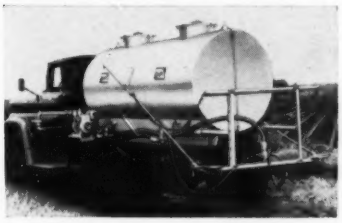


be rotated 180 deg., thus adding new life from the opposite side of the bearing. This is done *without removing the bearing from the shaft!*

Flexi-Blocks have been successfully applied in many applications, even in concentrated acid atmospheres.

A new 6-page Folder 2823, 'Flex-Block Sleeve Bearings,' describes application and selection data and dimensions. Load ratings are shown for T1 bearing material, which is oil-impregnated bronze. Other self-lubricating bearing materials have been developed for special bearing installations.

A copy of Folder 2823, 'Flex-Block Sleeve Bearings,' can be had free by circling number 20 on CF's Information Service card, page 59.



Liquid Truck Applicator

The Broyhill Company has announced production of a high capacity liquid fertilizer applicator designed for truck mounting. The unit is available in 1 or 2 compartment Plasti-Chem lined, plain or stainless steel, 1000 gallon tanks.

The distribution system incorporates a 100 gallon per minute centrifugal pump, which is controlled from the truck cab. The boom is available in various widths, and may be obtained in either angle iron and nylon, or stainless steel construction.

Meters may be mounted as optional equipment. Fertilizer mixers, dealers and applicators will find that the unit will increase daily acreage materially.

For further information, circle number 21 on CF's Information Service card, page 59.

Exhaust Gas Purifier

A device that takes dangerous fumes out of exhaust gases has opened the way for warehouse and plant managers to make the most of the economy, efficiency and power found in LP gas and gasoline-operated material handling equipment.

This Catalytic Purifier, introduced in 1950 by Oxy-Catalyst, Inc., oxidizes virtually all of the noxious elements in exhaust gases and permits the safe operation of LP gas and non-leaded gasoline-powered equipment indoors. It makes possible the use of LP gas and gasoline trucks which have the advantage of low initial cost, easy maintenance by mechanics familiar with truck and automobile engines, and ample power to negotiate steep ramps.

Many warehouse and plant managers have not used LP gas and gasoline-powered material handling equipment, because of the ever-present danger of the carbon monoxide and other contaminants in the exhaust fumes. Even where the area of operation was large and well ventilated, so the fumes did not present a health hazard, their presence was always detrimental to the employees' morale. The Catalytic Purifier removed these obstacles. While getting rid of harmful exhaust gases it also removed smoke and odors.

The units are easily installed by a mechanic or by the truck dealer. Many truck manufacturers factory install the OCM Purifier as optional equipment. Space requirements are approximately the same as for the regular muffler which it replaces.

For additional details, circle number 22 on CF's Information Service card, page 59.

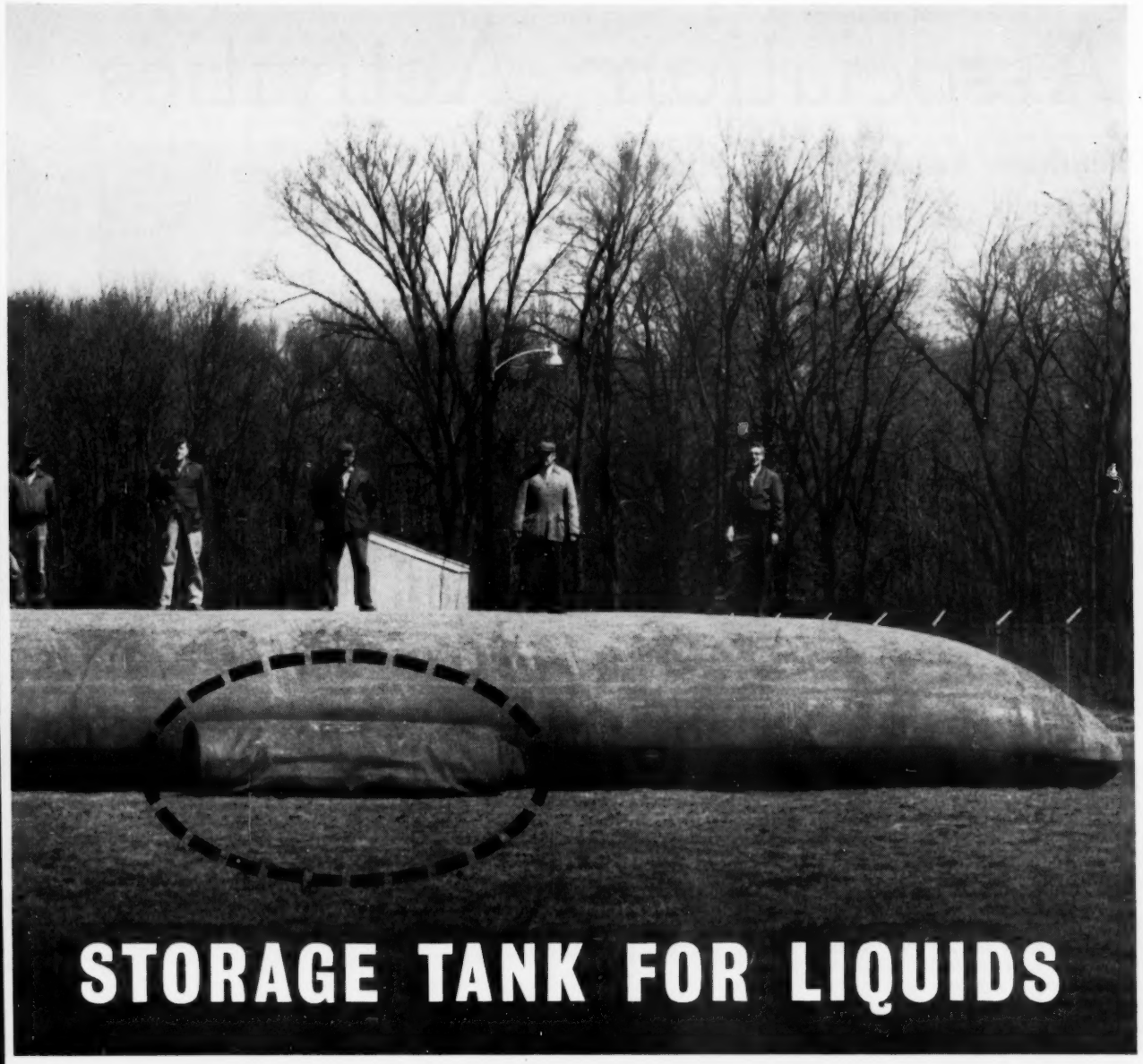
...folds to 30" x 40" x 8'! 50,000 gallons capacity? Maybe more... maybe less... than you need. But there's an economical-size, all-weather, portable Static Storage Tank to meet your requirements, too. U.S. Rubber's new line ranges in size from 500 to 100,000 gallons... service-proved for temporary or permanent storage.

When not in use, the envelope-shaped tank can be rolled into a small, compact package for storage. Lightweight, it is ready to be easily moved to another site for immediate use.

The tank assumes an oval shape when filled. This adds stability: no shoring, blocking, or any other support necessary. Its extra-large "footprint" helps to eliminate any tendency to roll.

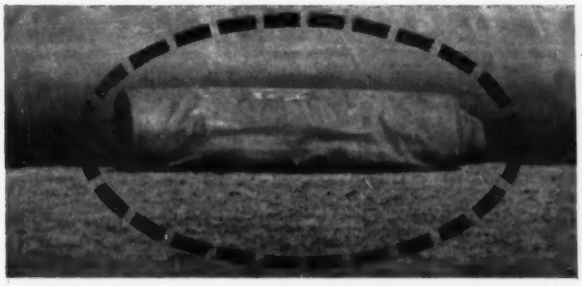
On the top of the tank there's a 10" x 16" manhole opening. The cover for the manhole mounts two standard fittings: one for filling and discharging, and another for venting.

There is an efficient, low-cost Static Storage Tank for your operations, too. For specification sheet write address at right.



STORAGE TANK FOR LIQUIDS

10,000-gallon-capacity Static Storage Tank at a farm, shown here accepting liquid fertilizer delivery near the actual site the farmer will work.



Rolled into a compact, lightweight package, this 50,000-gallon Static Storage Tank is ready for efficient storage or easy shipment to another site.

United States Rubber

Fuel Container Department • Mishawaka, Indiana

Association Activities

Solutions Associations Meeting Slated for Chicago October 30-November 1

The annual convention of the National Fertilizer Solutions Association will be held in Chicago October 30-November 1 at the Edgewater Beach Hotel.

National Fertilizer Solutions Association, represents one of the fastest growing segments of the fertilizer industry, has pioneered many new developments in materials and equipment which permit faster, easier handling of fertilizer products.

The program will feature outstanding speakers from all parts of the country. Archie V. Slack, chief of the fertilizer research program development staff at TVA, has written extensively about fertilizer production technology. He appears on the program to discuss suspension fertilizers, and will also have an extensive exhibit set up during the 3-day affair.

Slack

Also on the program is J. D. Sykes, vice president in charge of Public Relations for Ralston-Purina Co., whose topic will be "Serving the Modern Farm Market." Mr. Sykes, a former chairman of the board of directors of the American Feed Manufacturers Assn., has also served on the council of the World's Poultry Science Assn. Currently, he is a member of the board of trustees of the National 4-H Club Council, and is chairman of the National 4-H Builder's Council.

Another speaker on the program is Dr. G. Herbert True, vice president of the True-Klemp Organization, South Bend, Indiana. His topic is "The Care and Feeding of Ideas." Dr. True is dedicated to teaching businessmen how they can improve their status and profits, simply by changing their normal thinking habits.

"The Role of the Dealer in Fertilizer Sales" is the topic of a discussion to be presented by Drs. Joseph Bohlen and George Beal of Iowa State University. These men are considered authorities in the dissemination of ideas, particularly as they apply to farm practices. This is their second appearance before the National Fertilizer Solutions Association.

Two panel discussions, moderated by Dr. J. L. Strauss of Ris-Van, Inc., Belmond, Iowa will cover "Aids to Future Sales" and "Side-Dressing." Subjects such as trace elements, insecticides, pesticides, herbicides and various methods of side-dressing will be discussed.

Forty-one suppliers of raw ma-

Beal

Bohlen

terials and equipment for this industry will exhibit the latest developments in fertilizer solutions manufacture, transport, storage and application.

This convention will bring together members of the fertilizer solutions industry from most of the 50 states, Canada and England. It is believed that attendance at the 1961 convention will be 50% higher than any previous convention.

The Western Regional office of the National Plant Food Institute sponsored an exhibit of educational materials at the recent California Agriculture Teachers Association conference in San Luis Obispo. Pictured in the NPFI booth are, left to right, Dave Chapman, Balfour, Guthrie and Co., Ltd., Los Angeles; Dick Bahme, NPFI Western Director, San Francisco; and Bill Vogel, Cominco Products, Inc., Salinas. A new manual for vo-ag instruction, "Soils, Fertilizers, Crops — Demonstration Guides," was introduced at the Conference. The manual was developed cooperatively by California State Polytechnic College, the California State Bureau of Agricultural Education and the Western NPFI office.

NPFA Sets Cenference on Chemical Control

An important conference on chemical control procedures and problems in the fertilizer industry, sponsored by the Chemical Control Committee of the National Plant Food Institute, will be held in the Gold Room, Woodner Hotel, Washington, D.C., on Wednesday, October 25, 1961, Dr. Vincent Sauchelli, Chairman of the NPFI Chemical Control Committee, has announced.

Dr. Sauchelli explained that the

Industry Meeting Calendar

DATE	EVENT	LOCATION	CITY
Oct. 4-6	Southeastern Fertilizer Conference	Biltmore Hotel	Atlanta, Ga.
Oct. 12-13	Northeastern Fertilizer Conference	Schine Inn	Chicopee, Mass.
Oct. 16-17	Fertilizer Safety Conference	Pick-Congress Hotel	Chicago, Ill.
Oct. 25	Chemical Control Conference	Woodner Hotel	Washington, D.C.
Oct. 25-26	Fertilizer Control Officials	Woodner Hotel	Washington, D. C.
Oct. 30-Nov. 1	National Fertilizer Solutions Assn.	Edgewater Beach Hotel	Chicago, Ill.
Oct. 30-Nov. 1	Official Agricultural Chemists	Shoreham Hotel	Washington, D. C.
Nov. 2-3	Pacific N.W. Fertilizer Assn.	Gearhart Hotel	Gearhart, Oreg.
Nov. 8-10	Fertilizer Industry 'Round Table'	Mayflower Hotel	Washington, D. C.
Nov. 12-14	California Fertilizer Association	Jack Tar Hotel	San Francisco
	1962		
Jan. 10-12	Agricultural Ammonia Institute	Sheraton-Jefferson Hotel	St. Louis, Mo.
Feb. 15-16	Midwest Industry & Agronomists'	Edgewater Beach Hotel	Chicago, Ill.
June 10-12	National Plant Food Institute	The Greenbrier	White Sul. Spgs., W.Va.

meeting has been scheduled for the day prior to the meeting of the Association of American Fertilizer Control Officials, which meets in the same hotel in Washington, in order to enable many of the chemists attending the other meeting to participate in the NPFI Conference.

Chemists in the fertilizer industry and state regulatory service personnel are particularly invited to attend the meeting.

Agronomists Expect 1600 At 53d Meeting

A record total of over 1600 of the nation's soil and crop scientists will meet at St. Louis, Mo., Nov. 27-30 for the 53rd annual meeting of the American Society of Agronomy. The meeting will include the Soil Science and Crop Science Societies of America. Meeting headquarters will be the Sheraton-Jefferson Hotel with programs also at the Statler-Hilton Hotel and the Bishop Tuttle Memorial. The ASA last met in St. Louis in 1942.

Meeting jointly with the ASA will be an expected 150 agricultural meteorologists attending the Fourth Conference on Agricultural Meteorology. This group from the American Meteorological Society will have three joint meetings with the agronomists and two single programs.

Meeting also with the ASA will be the Council on Fertilizer Application—a group organized to promote research and development on improved fertilizer use and application. The CFA is holding two half-day programs.

Other groups meeting with the ASA will be under-graduate students, and agronomists specializing in education, extension, industry and military land management.

The overall meeting program includes a record total of 470 research papers involving about 750 authors. Abstracts covering most of the papers will be published in early October and the complete meeting program will be available about November 1st.

Officers of the ASA are Dr. B. R. Bertramson, Washington State Univ., Pres.; and Dr. G. W. Burton, Georgia Coastal Plain Exp. Sta., Tifton, Ga., Vice Pres. The Soil Science Society of America is headed by Dr. W. L. Nelson, American Potash Institute, Lafayette, Ind., Pres.; and Dr. C. A. Black, Iowa State Univ., Vice Pres. Crop Science Society of America officers are: Dr. J. M. Cowan, Oregon State Univ., Pres. and Dr. R. P. Murphy, Cornell Univ., Vice Pres.

Two Groups Meeting with Agronomists November 27

APPLICATION COUNCIL

The Council on Fertilizer Application is holding its meeting this year in conjunction with the American Society of Agronomy meeting, Nov. 27-30 in St. Louis, Mo.

The Council on Fertilizer Application has scheduled two one-half day programs for Monday, November 27th. The meetings will be held in the Sheraton-Jefferson Hotel — the ASA headquarter's hotel. Dr. A. J. Ohlrogge, professor of agronomy at Purdue University and vice chairman of CFA, will preside at both meetings.

SOIL SCIENCE SOCIETY

The Soil Science Society of America will mark its Silver Anniversary during the 25th Annual Meeting of the Society, Nov. 27-30 in St. Louis, Mo.

Initial 1936 membership of the Society was about 500, but this has grown to nearly 2200 in 1961, with members located in more than 50 countries around the world.

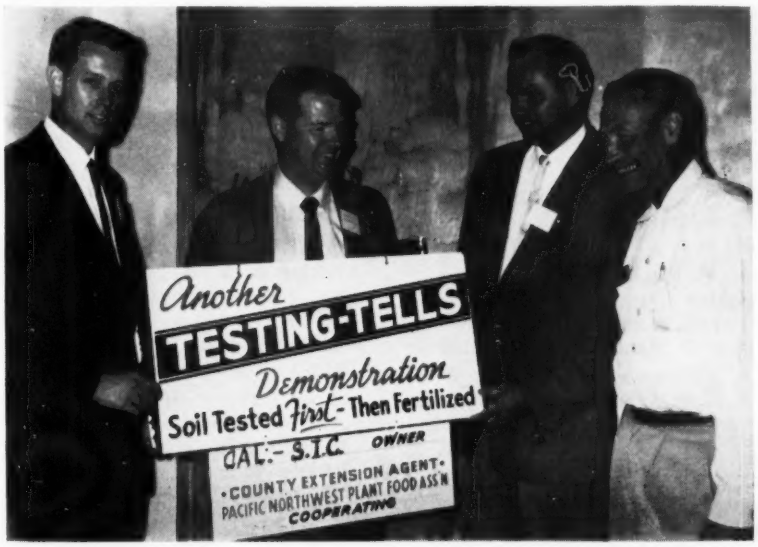
About 1000 of the soils men are expected to attend the St. Louis meetings to hear nearly 250 research reports dealing with soil science. Meeting headquarters is the Sheraton-Jefferson Hotel.

Pacific Northwest Pushes 'Testing Tells' Program

Ed Gould, Shell Chemical Company, Chairman of the California Soil Improvement Committee was presented a "Testing Tells" sign by Grant Braun, American Potash Institute, and Chairman of the Soil Improvement Committee of the Pacific Northwest Plant Food Association at the Association's 12th Annual Fertilizer Conference in Salem, Oregon. Glen Holt, U. S. Borax Company, left, initiated the "Testing Tells" project for the Association and Art King, Oregon State University, right, Extension Soils Specialist coordinated the project for Oregon States.

The presentation was made to Chairman Gould to encourage the California group to undertake a forage demonstration program similar to "Testing Tells." The Oregon project was started three years ago in six counties to demonstrate the value of proper fertilization based on soil testing in forages, pastures and feed grains. The "Testing Tells" program has now been expanded to 10 Western Oregon counties and includes some 104 fertilizer trials. Attractive four-color signs such as the one above are located on each plot.

The program has also been expanded to include soil test promotion and tours. Yields and quality samples were taken on most plots. The jointly sponsored project between the Pacific Northwest Plant Food Association and Oregon State University is to be continued this year, and will include comparisons between fall and spring applied materials on legumes. The program is an outstanding example of Industry and Official Agriculture cooperation.



Left to right: Glen Holt, U. S. Borax & Chemical Corp., Ed Gould, Shell Chemical Co.; Grant Braun, American Potash Inst.; and Art King, Extension Soils Specialist, Oregon State Univ.

Round Table MEETING IN WASHINGTON, NOV. 8-10

Plans for the 1961 Fertilizer Industry Round Table are virtually complete, and the executive committee has announced the tentative program.

Theme of the industry-wide technical conference this year will be "Materials Handling," and the committee has worked out a full schedule of topics covering every facet of the subject.

The meeting will take place November 8-10 at the Mayflower Hotel in Washington, D.C. Registration will begin Tuesday evening, November 7, at 7:30 p.m. and continue to 9:30 p.m., and the desk will open again at 8:00 a.m. Wednesday, initial day of the sessions.

Attendance at the conference does not require membership in any association, as the Round Table is a self-sustaining body, composed of all who attend the meeting and pay the $7.50 per person registration fee, which includes a printed copy of the proceedings of the meeting. Anyone with an interest in the fertilizer industry is eligible to register.

The executive committe is composed of four men, selected at each meeting to serve for the following year's meeting. The current committe consists of Vincent Sauchelli (chairman), chemical consultant for National Plant Food Institute; H. L. Marshall of Olin Mathieson Chemical Corp., Baltimore; Joseph E. Reynolds, Jr., of Davison Chemical Division, W. R. Grace & Co., Baltimore; and Albert Spillman of Fertilizer Manufacturing Cooperative, Baltimore.

After selection of a central theme, the committee builds the program around questions submitted by mail from the men who attended the most recent meeting of the Round Table.

The tentative program set up for 1961 is as follows:

WEDNESDAY, 9:00-12:00 *a.m.*

Opening Remarks—V. Sauchelli
Materials Handling—Keynoter
Materials Handling—Bulk Solids
- A. Pneumatic Systems
- B. New Methods of Transportation and Unloading of Bulk Solids

Review on Conditioning Agents in Mixed Fertilizer.

WEDNESDAY, 2:00-5:00 *p.m.*

Materials Handling—Weighing
Fundamentals of Weighing
Materials Handling—Liquid
- A. Anhydrous Ammonia and Solutions
  1. Unloading (High and Low Rates)
     - a. Pressure Systems (Use of Air Pumps)
     - b. Methods determining Content of Car or Storage Tank at any stage of Unloading.
     - c. Control of Nitrogen Losses in Handling Systems from Car to Mixer.
  2. Storage Facilities
     - a. Tank Construction (Corrosion)
     - b. Phosphoric Acid
     - c. Sulphuric Acid

How to Create and Maintain Interest in Plant Safety.

THURSDAY, 9:30-12:00 *a.m.*

Materials Handling—Bags
- A. Introduction
- B. Sack Construction
- C. Packers—Review
- D. Palletizing and Stowing

Materials Handling—Dust Collecting in Plant Review
Application Review

THURSDAY, 2:00-5:00 *p.m.*

Croplife Survey of Mixed Fertilizer Production
Progress Report on Standardization and Uniformity
- A. Users
- B. Nitrogen
- C. Phosphates
- D. Potash

Application of Spherodizer to Granulation
Handling of Liquid Sulphur

FRIDAY, 9:30 *a.m.—finish*

Composition and Use of New Materials in Fertilizer Formulation
- A. Diammonium Phosphates
- B. Conventional Semi-Granular, Granular
- C. Bulk Blending

CFA 38th ANNUAL CONVENTION

Program for the Thirty Eighth Annual Convention of the California Fertilizer Association is nearing completion, according to James F. Sloan, association president.

To be held at the Jack Tar Hotel, San Francisco, November 12 through 14, 1961, this convention will attract 500 or more industry leaders from all over the United States, and from Canada and Mexico as well.

Featured speakers will include Ralph Everett, Director of Empire Sales Training, Inc., Miami, Florida, and Stary Gange, Visalia. Everett is a nationally known authority on effective salesmanship. He has counselled with many of America's largest sales organizations.

Gange is one of California's best known and most eloquent exponents of the American enterprise system. He effectively exposes pitfalls of socialism.

The ladies will be guests of the association at a luncheon, where they will be entertained by Paul Speegle, humorous columnist and commentator for the San Francisco News-Call Bulletin.

Four Directors will be elected to serve for three years, and the 1962 officers will be chosen by the new twelve-man Board.

Recreation will consist of mens' and women's golf tournaments, a mixed bowling tournament, and bridge and canasta competition. Prizes will be awarded winners in these events.

The convention will come to a close following the annual banquet on the evening of November 14. Dinner dancing will be enjoyed to the music of Ray Hackett and his orchestra.

Mr. Sloan urges all persons interested in attending to contact the office of the association at 719 K Street, Sacramento 14, California for complete information, advance registration form, and printed program.

CFA Brochure

The CFA Soil Improvement Committee has just published a brochure entitled "Career Opportunities in the Fertilizer Industry." It will be distributed during the coming school year to high school and junior college class counsellors, and through them to their students.

The brochure was developed as a key activity of the Joint Action Committee on Career Opportunities in Scientific Agriculture. Weir Fetters, The Best Fertilizers Company, Stockton, of the Soil Improvement Committee, is chairman of the joint action group. His committee is broad in its coverage of agribusiness, agricultural education, research, and extension.

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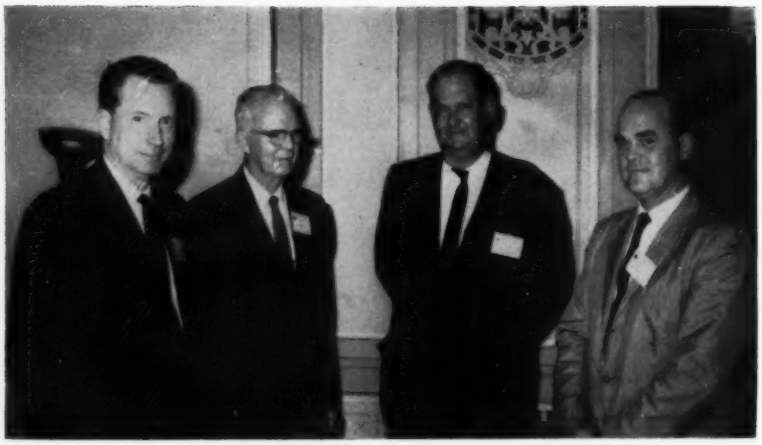
TENNESSEE CORPORATION
612-629 GRANT BUILDING, ATLANTA 3, GEORGIA



NEW FERTILIZER AND SOIL CHEMISTRY OFFICERS
New officers of American Chemical Society's Fertilizer and Soil Chemistry Section are (left to right): D. R. Boylan, new vice chairman; J. O. Hardesty, retiring chairman; L. B. Hein, incoming chairman; and W. J. Tucker, new secretary.

Fertilizer and Soil Chemists Elect New Officers

American Chemical Society's Fertilizer and Soil Chemistry Division met last month in Chicago with an excellent attendance. The four-day meeting, beginning September 4, featured six sessions and a luncheon meeting.

New officers were elected by the Section, with Larry Hein of Olin Mathieson Chemical Corp., Joliet Ill., elected to chairmanship, succeeding John Hardesty of U. S. Department of Agriculture, Beltsville, Md.

New vice chairman is Dave Boylan of Iowa State College, Ames, and the new secretary is Bill Tucker of Cooperative G.L.F. Soil Building Service, Ithaca, N. Y.

New councilor—for a term expiring with 1964—is W. J. Hanna of Rutgers University, New Brunswick, N. J.: alternate is C. E. Waters of Allied Chemical's Nitrogen Division, Hopewell, Va.

Councilor remaining in office, with term expiring in 1963, is J. D. Romaine of American Potash Institute, Washington, D. C.; alternate remaining in office is A. B. Phillips of TVA's Division of Agricultural and Chemical Development, Wilson Dam, Ala.

Attendance at the sessions was exceptionally good, the audience ranging from about 100 to nearly 150. A broad range of topics was covered in the meetings, with papers presented by a great many of the industry's foremost scientific and technical contributors.

COMING MEETINGS

October 18, **Kentucky Fertilizer Conference,** Spindletop Research Center, Lexington.

October 25-26 **Control Officials** 15th annual convention at Woodner Hotel, Washington, D. C.

November 6 **South Carolina Plant Food Educational Society** annual meeting: The Clemson House, Clemson.

December 6-7 **Alabama Soil Fertility Society** annual meeting at the Whitley Hotel, Montgomery. Bill Nichols is convention committee chairman.

December 7-8 the **Michigan Fertilizer and Lime Conference** will be held at Kellogg Center, Michigan State campus.

April 9-12 and April 13-14 **The 4th International Symposium on Plant Nutrition** will be held in Pisa, Italy April 9-12 and Florence, Italy, April 13-14. For details write Comite d'Organization, Instituto di Chemical Agraria dell'Universita, via S. Michele degli Scizi 2, Pisa, Italy.

RESEARCH RESULTS & REPORTS

Phosphorus Accumulates in Soil

A long-term Oklahoma Experiment Station study has shown the residual effect of phosphorus fertilizer. Chemical determinations and yield records in 1960 showed substantial accumulations of phosphorus in the soil as a result of regular applications of rock and superphosphate from 1916 to 1958.

Over the 42-year period, superphosphate was applied yearly at the rate of 125 to 150 pounds per acre. Rock phosphate was applied every four years at the rate of 500 to 1,000 pounds per acre.

In 1960, chemical analyses of soil samples indicated that research plots which had received no phosphorus fertilizer during the test period had 15 pounds of available phosphorus per acre in the top 6 inches compared with 86 pounds for plots treated with superphosphate and 314 pounds for plots treated with rock phosphate. In terms of total phosphorus, the figures were 363, 522 and 754 pounds per acre for plots receiving no phosphorus, superphosphate and rock phosphate, respectively. The phosphorus accumulated in the top 6 inches of the soil and there was no accumulation or movement into the 9 to 12 inch zone.

The accumulation of phosphorus was reflected in crop yields during 1960 research trials. Research plots which had received no phosphorus during the 1916 to 1958 period averaged 5,697 pounds of sorghum forage per acre. Plots which had received annual treatments of superphosphate during the 42-year period averaged 6,843 pounds of forage per acre, and plots fertilized with rock phosphate averaged 8,035 pounds of forage per acre.

Cotton and wheat showed similar yield increases on phosphate treated plots.

Hybrid Wheat Coming Up?

The possibility of commercial hybrid wheat has become at least a small step closer to reality with the announcement that the Kansas Agricultural Experiment station will release hard red winter wheat germplasm that produces no seed when it is self-pollinated.

Glenn H. Beck, director of the station, emphasized that germplasm is released only when enough seed is available to fill the expected requests of bonafide plant breeders.

Midwest Farmers Need More Fertilizer

The National Plant Food Institute estimates that in the Midwest only 9 per cent of the farmers use plant food on their two main crops at rates recommended by State agricultural experiment stations, 55 per cent use less than enough fertilizer, 36 per cent use none at all.

Once-a-year N Fertilizer

A German company has developed a fertilizer which, it is claimed, releases nitrogen to the soil as and when required. It is recommended in particular for lawns and need be applied only once a year.

The fertilizer has a pure nitrogen content of 28 per cent, nine-tenths of which is held in a combination of urea and crotonaldehyde. This combination "doses" the release of nitrogen to the soil according to the temperature: when it is warm and the rapid growth of the grass calls for more nitrogen, the process works quickly; when the temperature drops, it is retarded.

NEW APPLICATION DEVELOPMENTS

International Develops One Shot Grass Practice

Canadian International Paper Co. says its new product, Turfiber, is a big advance in the establishment of turf—and opens up a broad new use for wood pulp.

CIP says one of its Quebec plants will start to produce Turfiber early in 1962. It will sell for about $135 a ton—enough to take care of two acres.

This special, green-colored wood pulp is mixed with grass seed, fertilizer and a resin emulsion in a water slurry, and the mixture is machine-sprayed on areas to be seeded.

The pulp forms a mat which reduces erosion and holds grass seed in place to assist germination and growth.

Seedling, fertilizing and mulching, says CIP, are accomplished in a single operation, at a cost of between 8¢ and 10¢ a sq. yd. (or from $400 to $500 an acre, depending on application).

CIP says its new method is 15% to 20% cheaper than the best hydraulic seeding-fertilizing and straw or hay mulching practices now in use.

He Guarantees Grass in 48 Hours

A Toronto nurseryman is selling "rapid grass," guaranteed by him to grow in 48 hours.

Jack R. Allen, proprietor of Sunnybrook Nurseries, started packaging the pre-germinated grass seed about six years ago. This season, he's selling it through stores in Toronto at $3.49 a refrigerated bag.

He says one bag will cover 500 sq. ft. of ground.

"We take the dehydrated grass seeds—Kentucky and Park Blue, Highland Bent and Chewing's Red Fescue—and pre-germinate it with aggregate," he says.

"The embryo of the seed is ready to break, but we refrigerate it and suspend germination for up to a week.

"We deliver the 'rapid seed' to the stores on a Thursday morning, and on Monday we pick up what's not sold."

He says that seed left in the bag too long "explodes like popcorn—why, it just goes on growing."

Machine Plants, Fertilizers and Lays Mulch

A revolutionary machine that prepares a seedbed, plants seeds, fertilizes the ground, lays a 40-inch wide plastic mulch and punches holes in it for plants to grow through has been successfully tested at Texas A & M college.

The experimental machine was developed by Texas A & M horticultural researchers in cooperation with U. S. Industrial Chemicals Company, a major polyethylene producer, which supplied the 1½ mil plastic mulch film used in the tests. A wide variety of plants, including cucumbers, cantaloupes, watermelons, squash, okra, peas, peppers, tomatoes and even cotton were planted and grown with excellent results in the field trials.

"With a few adjustments and refinements in the machine, the use of black plastic film for vegetable crops can be a once-over operation. Most of the hand labor is eliminated," the Texas research report states.

U.S.D.A. Marks 50th Anniversary Of Fertilizer Research Program

This year marks the 50th anniversary of the first appropriation by Congress for research in fertilizer technology. Responsibility for this work was assigned in 1911 to the USDA.

The first Federal appropriation for fertilizer research was used to survey possible sources within the U.S. of natural fertilizers. Growth and accomplishments of USDA work in this field during the past half century have strongly influenced development of U.S. fertilizer production.

World War I spurred research on fixation of atmospheric nitrogen. A pioneer experimental unit for synthesis of ammonia from air was built by USDA. Followup studies are credited with establishment of our synthetic ammonia industry, which today is the largest in the world. USDA personnel participated in commercial application of the process.

Other laboratory and pilot-plant operations led to manufacture of phosphoric acid by the furnace method. Extensive studies were made also on superphosphate ammoniation, composition and properties of phosphate rock, and other phases of phosphate technology.

Granular fertilizer mixtures have come from research on improving grade and physical condition of constituent materials.

Recent work includes studies of trace-nutrient materials, and behavior of pesticides and other agricultural chemicals in mixtures with fertilizers. USDA initiated preparation and distribution of radioactive fertilizers for use in research. They are contributing new knowledge and understanding of complex soil-plant-nutrient relationships. These and other studies now being conducted promise to make still more efficient the use of fertilizers in crop production.

NEW PUBLICATIONS

'Management for Profit' New IMC Contribution

How can efficient management brighten the profit picture of an average-sized fertilizer manufacturer?

With this basic question in mind —and many other areas to be considered in detail—a book entitled "Managing For Profit" has just been published by International Minerals & Chemical Corporation.

The book has a two-fold purpose: to review fertilizer management practices and to suggest specific ways to improve operating efficiencies.

The 445-page book was used by IMC as the reference text for a 3-day Fertilizer Management Seminar held at the firm's Administrative Center in Skokie, Illinois, in July. It contains sections on both the theory and actual practice of sound management.

The theoretical section is a reprint of IMC's Full Orbit Manual collection, a series of sales-oriented booklets given to manufacturers.

The theories were brought to life in the three-day seminar through a hypothetical company in "Fertile Valley, Illinois," known as the Makmor Fertilizer Company. President and principal spokesman for the company is Will I. Makmor.

Two hundred pages of the book, which is being distributed to all IMC customers, are devoted to helping Makmor solve its current problems and to suggesting methods of increasing profits.

Makmor's problems are many, varied and typical. Competition is increasing from the five other producers already located in Makmor's sales area.

There is a constant flux in demand for many mixed grades of fertilizer. An immediate problem is the firm's conveyor system, which is overdue for replacement.

New selling techniques must be given to Makmor's sales force. Community relations have suffered because of the fumes produced by the Makmor plant.

Accurate budgeting has become increasingly important to Makmor and the firm needs more ready cash.

The IMC answer to these and other problems is contained in the book. Each chapter deals with a specific area of plant management. The sections were prepared by the IMC executives who presented them at the seminar.

NPFI Corn Profit Leaflet

"More Profit from Corn in Minnesota" is the title of a leaflet prepared by the National Plant Food Institute in cooperation with the University of Minnesota and the Minnesota Bankers Association, announces Zenas H. Beers, Midwestern Regional Director for the Institute.

Distribution of the leaflet will be made by the three organizations.

"A good portion of the leaflet emphasizes the advantages farmers can 'reap' from their soil resources with good management as opposed to average management," Mr. Beers said.

"Such management can mean $19.92 more profit per acre, which will permit farmers to maintain income with fewer bushels and fewer acres.

"This leaflet can help encourage Minnesota farmers to use known and proved soil fertility facts so that they can compete with success and profit with corn growers in other states and areas."

New IMC Publication

International Minerals & Chemical Corporation has added a new publication—Technical Service News—to its "Full Orbit" customer service program.

The free quarterly publication gives fertilizer manufacturers the latest information about operating techniques, process innovations, formulation, maintenance, safety and engineering. The four-page newsletter is edited by Richard G. Powell, IMC technical service manager.

The first issue contains information about maintenance of motors, spray nozzles and pumps; plant housekeeping tips; materials spillage losses; and lubrication of mixers or similar rotary equipment.

Free copies may be obtained by writing Technical Service Department, International Minerals & Chemical Corporation, Old Orchard Road, Skokie, Illinois.

Armour Buys 120 Tank Cars of Aluminum

Armour & Co. has ordered 120 aluminum tank cars from General American Transportation corporation.

The 10,000 gallon aluminum cars, insulated with fiberglass, will be used to carry liquid nitrogen fertilizer produced by Armour Agricultural Chemical company.

Delivery of the first car is scheduled for February, 1962.

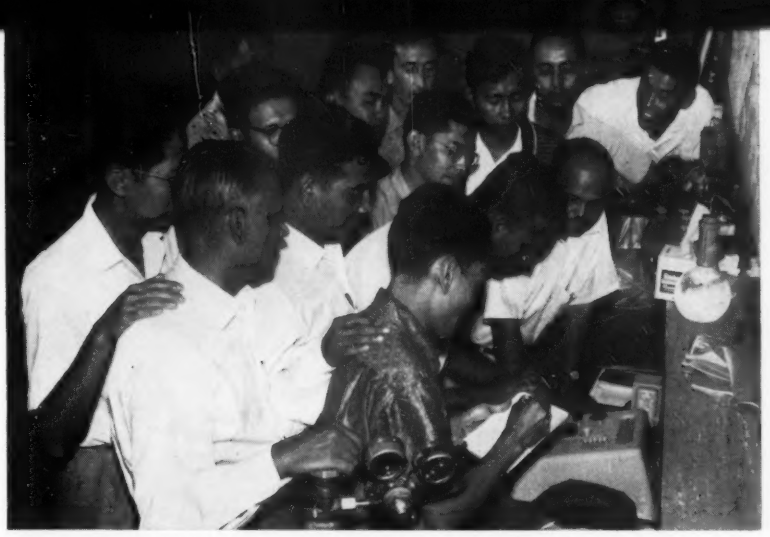
St. Regis "Weathervane" A Monthly, Graphic Forecast

The bag division of St. Regis Paper Company is offering a unique new service for its customers in the agricultural, chemical, food and rock products industries. It is a monthly forecast which helps them determine how their business will be affected by that important but elusive element—the weather.

Called the St. Regis Weathervane, the service is exclusive with St. Regis in the bag and bag packaging equipment industry. It pinpoints, area-by-area across the country, what the weather is most likely to be a month in advance, and what it most probably will be the following two months. It is designed as an across-the-board marketing aid for members of various industries which package their products in multiwall and textile bags.

The detailed weather information is supplied to St. Regis by Weather Trends, Inc., a private weather forecasting agency which has a record of 75% to 85% accuracy in weather predictions.

The report, in the form of a 4-page newsletter, is mailed to St. Regis customers a week before the beginning of each month. Through easy-to-read maps and graphs, the Weathervane forecasts the weather in terms of the temperature averages and the amount of precipitation that can be expected week by week in any given area of the country.



FOREIGN SCIENTISTS STUDY INSTRUMENTATION

Fourteen agricultural chemists and agronomists from nine Asian and South American countries recently completed a two-day instrumentation seminar at Coleman Instruments, Inc., Maywood, Ill. The group consisted of officials and technical workers from institutions and ministries of agriculture from Argentina, British Guiana, Republic of China, India, Indonesia, Korea, Peru, Thailand and Turkey. They attended a 9-week, graduate-level course in soil testing and modern soil fertility practices conducted by the University of Illinois and sponsored by the International Cooperation Administration. The course, organized in recognition of the urgent need for increasing the world's agricultural output, is part of the Foreign Visitors Training Program of the University of Illinois.. The course includes studies of soils, plant nutrition, soil testing and fertilizer application.

Statement of Ownership, Etc., of
COMMERCIAL FERTILIZER AND PLANT FOOD INDUSTRY
as of October 1, 1961

Publisher: Walter W. Brown Publishing Co., Inc., 75 Third St., N.W., Atlanta 8, Ga.

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Business Manager: V. T. Crenshaw, 75 Third St., N.W., Atlanta 8, Ga.

Owner: Walter W. Brown Publishing Co., Inc., 75 Third St., N.W., Atlanta 8, Ga.
Ernest H. Abernethy, 75 Third St., N.W., Atlanta 8, Ga.
Virginia T. Crenshaw, 75 Third St., N.W., Atlanta 8, Ga.
Allen W. Hill, Elon A. Abernethy, Jr., James W. Baker, Trustees for Ernest H. Abernethy, Jr., a minor under the laws of Georgia.
Allen W. Hill, Elon A. Abernethy, Jr., James W. Baker, Trustees for James Elon Abernethy, a minor under the laws of Georgia.

Bondholders, mortgages, etc.: None.

The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was 3461.

Signed: Ernest H. Abernethy, President

Sworn to and subscribed before me, a Notary Public, this 19th day of September, 1961.

Mary C. Layman, Notary Public.

(My commission expires August 2, 1964.)

—of This and That . . .

_____Soil Testing on the Moon: Before man sets foot on the moon, he will be well informed of the surface condition he will encounter, thanks to work presently being done at Armour Research Foundation. Results so far include development of a special robot moon drill that will ride aboard the first U. S. soft-landing moon rocket, the Surveyor, to be launched in Spring of 1963. The completely automatic moon drill will burrow five feet into the moon's surface, retrieve a sample, analyze it and transmit the findings back to U. S. scientists.

_____Because of rain dumped by Hurricane Carla last month, Olin Mathieson's plant on the ship channel at Houston, was flooded out of operation. According to plant manager John Beatty, the storm knocked the plant out for a while as a lot of underground facilities were flooded.

_____John McGregor, superintendent of Olin Mathieson's fertilizer and phosphate department, Curtis Bay, Baltimore, retires in January, 1962. Last month, employees of the plant got together and gave a dinner for Mr. McGregor, honoring his 50 years of service. Plant Manager A. B. Moon, associated with Mr. McGregor since 1949, presented him with a service certificate and diamond pin.

_____A diamond-studded pin for 50 years service was awarded to Perry Bradley, district sales manager for Virginia-Carolina Chemical Corporation, at the company's annual stockholders meeting at Richmond, Va. Mr. Bradley has been with V-C in Memphis since 1920.

_____Ellis T. Woolfolk, president Mid South Chemical Co., has been named fund agent for the class of 1923 in a $200,000 endowment drive by Davidson, N. C. College . . . E. Meade Wilson, IMC's Plant Food Division area manager with offices in Mulberry, was reelected president of the Florida Agricultural Research Institute. He became president a year ago and had previously been a vice president and director . . . Ellis T. Hover, controller and assistant treasurer, Eastern States Farmers' Exchange, Inc., West Springfield, Mass., has been elected to membership in the Controllers Institute of America.

_____Glimpsed in an UP International photo last month (which made most of the newspapers over the country) was Gov. E. N. Carvel, Delaware, who is also president of Valliant Fertilizer Co., Laurel, Del. Distinguished associates in the picture were: Vice President Lyndon Johnson, Gov. Price Daniel, Texas, and Gov. Buford Ellington, Tennessee.

_____Ray Umbaugh, of Hagerstown, Md., who has already made the millionaire bracket in mass sale of fertilizer, is gambling that thousands of individuals will buy his $10,000 autogyro for personal or business use. Early orders have come in from companies which must patrol oil and gas pipelines over vast areas; ranchers and crop dusters. The two-seater can take off and land on a five-foot "runway." Its backers say its operation is almost as simple as driving a car and that it will be the safest aircraft of autogyro rotors which floats the craft down even with the engine shut off.

_____Word from Ted V. Reyes, proprietor of Growbig Products and Garden Supply, Manila, Philippines, tells us of his success in marketing his "Growbig" brand and his plan to franchise its trademark and design outside the Philippines. Mr. Reyes may be addressed at P. O. Box 322, Manila, Philippines.

_____The defoliant most likely to pass a memory test is Stauffer's S. E. X (sodium ethyl xanthate).

_____New hope for prolonged skiing season was prompted by the successful results of an experiment conducted on the slopes of the internationally famous ski resort of St. Jovite, this past summer. Engineers applied ammonium nitrate to ski runs—and soft, melting snow was transformed into a hard-packed, but not icy surface. Within five minutes the snow surface which previously had been unable to withstand a man's weight, supported a skier with ease and even resisted a not too gentle tramping. Lucille Wheeler, former world's ski champion, on hand to witness the experiment, said that "without further testing, the surface created would be ideal for a slalom race."

_____Statistics which attest to the size and development of the phosphate industry in Florida: Last year, with 6895 workers drawing $35,600,000 in wages, Florida's phosphate industry furnished 12,500,000 tons of phosphate rock—equal to one-third of the world's supply.

FELLOWSHIPS

Thirteen fellowships, valued at $5,000 each, have been awarded applicants from 11 Southern states by the Agricultural Policy Institute at North Carolina State College.

The winners were announced Sept. 20 by Dr. C. E. Bishop, head of the college's Department of Agricultural Economics and director of the Institute.

Dr. Bishop said the fellowship winners represent people who occupy specialist and administrative positions at state or regional levels of public agencies that have a direct interest in agricultural adjustment and public policy affecting the Southern states. A similar fellowship program will be sponsored by the Institute for the next four years.

SCHOLARSHIPS

Twelve students at leading mining and agricultural colleges have been named winners of the 1961-62 Louis Ware senior-year scholarships. The $1,000 awards are sponsored by International Minerals & Chemical Corporation, Skokie, Illinois.

In addition, the six winners in each category become eligible to compete for $3,000-a-year, three-year fellowships, one in mining and one in agriculture. The scholarship-fellowship program is named in honor of the IMC board chairman who for 20 years was president of the company.

Fourteen county agricultural agents from five states have been awarded scholarships to attend extension courses in communications next year.

Names of the winners were announced at the annual meeting of the National Association of County Agricultural Agents (NACAA), September 10-14.

The new scholarship program, sponsored by International Minerals & Chemical Corporation, is designed to further the county agents' abilities in using communications to bring new ideas and techniques to farmers.

GRANT

The Texas Research Foundation at Renner has been awarded a $3,000 grant by International Minerals & Chemical Corp. to continue a study on plant nutrition and soil fertility.

Dr. William H. Longstaff will direct the project that is studying amounts of potash and magnesium needed for Bermuda grass pastures.

Survey Says Ammonia Use Up 10%

Total usage of agricultural anhydrous ammonia is up 10% for the fertilizer year ending July 31 over that of last year, according to survey figures just released by the Agricultural Ammonia Institute.

The Institute's survey reached approximately one-fifth of the nation's direct application ammonia. This indicates total tonnage in the nation of about 790,000 for the past year as compared with 717,000 tons for the 1959-60 year.

Jack F. Criswell, Institute executive vice president, said that the survey picture showed that 158,850 tons were used in 1961 against 144,718 tons for 1961 or a net gain of 14,132 tons of ammonia.

The Institute survey covered 24 states with more than 140 major distributors contributing consumption figures.

"Not all of the distributors showed increases," Mr. Criswell pointed out. Reasons given for lower sales included, the Government farm program (reduced acreage planted) and adverse weather conditions which either hindered or completely prevented ammonia application.

Some of the dealers in the lower sales areas also said that adverse spring weather caused more land to be put into the Government program.

"However, the ratio for dealers with increased tonnage was more than two to one which provides a good note of optimism for the Industry," Mr. Criswell said.

When asked how they increased sales, dealers stated that they had engaged in greater promotional activity, including field demonstrations, farmers meetings and education, improved service, and more "on farm" attention to customers in addition to their normal sales advertising activities.

During the January 1-July 31 period, the dealers reported 36 per cent of their ammonia went down preplant while 64 per cent was used for sidedressing.

As to prospects for fall application this year, 15 per cent of the distributors said they expected them to be "good to excellent." Twenty-nine per cent indicated "fair" prospects, and 45 per cent said "poor."

"Where fall prospects were poor," Mr. Criswell said, "in many cases there was strong indication that inadequate promotion was a contributing factor. Unless farmers can be made aware of the many benefits of fall application, this practice will fail to make the progress it should make."

Obituaries

Charles L. Gohr, 85, former secretary-treasurer of the Stadler Fertilizer Co., died in St. Luke Hospital, London, Ohio.

Deppish Kirkland, 83, well known Savannah, Georgia, retired fertilizer manufacturer and banker, died August 18, in a Savannah hospital.

Dr. Ora Sherman Morgan, 84, former head, Department of Agricultural Economics, Columbia University, died—apparently of a heart-attack on his farm near Chico, California August 14. He joined the Columbia faculty in 1911, and retired 32 years later.

Frederick Pope, 83, pioneer in the organization of synthetic ammonia plants in the US and other countries, director of American Cyanamid, from 1929, died August 11 in hospital at Norwalk, Connecticut, after a short illness.

Isla Robb, who retired two years ago after many years with American Potash and Chemical in New York City, died August 27 in Little Falls, New Jersey, after a long illness.

CF Staff-Tabulated TONNAGE REPORTS

FERTILIZER TONNAGE REPORT (in equivalent short tons) Compiled by Cooperating State Control Officials and Tabulated by COMMERCIAL FERTILIZER STAFF

	August		July		April-June Qtr.		January-June		July-December		YEAR (July-June)	
STATE	1961	1960	1961	1960	1961	1960	1961	1960	1960	1959	1960-61	1959-60
Alabama	25,354	23,789	23,054	16,645	548,583	612,918	812,241	869,240	181,587	180,959	993,828	1,050,199
Arkansas	12,047	8,666	22,004	20,558	217,881	204,314	312,038	303,835	61,633	58,713	373,671	362,548
Georgia	41,520	25,274	95,429	83,684	1,063,441	947,923	1,202,510	1,102,220	313,241	299,194	1,515,751	1,401,414
Kentucky	------	14,545*	------	10,484*	288,920	319,164	459,375	461,786	102,192	108,734	561,567	570,520
Louisiana	7,100	7,120	11,357	13,765	147,176	150,438	220,340	224,087	73,814	66,744	294,154	290,831
Mississippi	24,313*	----	15,823	17,671	349,135	374,717	550,528	545,423	145,632	144,374	671,918	689,797
Missouri	------	49,891*	24,910	17,313	386,185	434,606	547,116	524,336	334,657	277,708	881,783	802,044
N. Carolina	14,130	16,658	21,083	14,355	870,935	988,133	1,371,080	1,381,263	202,694	175,533	1,573,774	1,556,796
Oklahoma	17,930	16,653	12,870	6,545	51,411	52,726	87,844	72,246	94,690	72,511	182,534	144,757
S. Carolina	31,114	25,064	17,650	11,122	305,326	411,739	693,165	678,986	110,096	104,903	803,261	783,889
Tennessee	28,724	27,256	19,802	17,626	317,830	353,905	467,997	482,980	124,747	117,275	592,744	607,727
Texas	39,949	32,845	40,581	34,355	308,879	281,701	531,678	474,626	234,376	233,410	766,056	708,037
California			(reports compiled quarterly)		480,241	462,857	835,001	813,116	462,347	465,495	1,297,348	1,278,611
Virginia			(reports compiled quarterly)		------	369,502*	------	591,113*	168,479	141,177	------	732,290*
Indiana				(reports compiled semi-annually)			797,711	828,164	317,372	321,956	1,115,083	1,150,120
TOTAL	**217,868**	**183,325**	**304,563**	**253,639**	**5,335,943**	**5,595,141**	**8,888,624**	**8,762,308**	**2,927,557**	**2,768,686**	**11,623,472**	**11,397,280**

------ (not yet reported) * Omitted from column total to allow comparison with same period of current year.

classified advertising

RATES: 50 cents a line for **Situations Wanted** ads; $1.00 a line for **Help Wanted** ads; $2.00 a line for all other classified advertising. Word count runs approximately eight words per line. Copy should be received by 15th of month preceding publication. **Display Classified Advertising** $15.00 an inch; minimum space one inch.

HELP WANTED

FACTORY REPRESENTATIVE—Well Known Midwest Manufacturer of Specialized Fertilizer Solution Equipment is seeking qualified men for sales expansion. College education helpful. Sales experience in fertilizers, farm equipment and the ability to command customer respect most important.

This sales position offers unlimited potential in earnings and personal growth for hard working aggressive man. Liberal commissions with an exclusive territory.

In reply state education, complete information on sales experience and past employment, age, family, references. Please address resume to Tryco Mfg. Co., Inc., P.O. Box 1277, Decatur, Illinois.

WANTED: Package fertilizer salesmen for Alabama, Georgia, and Tennessee. Prefer College Graduates in Horticulture, age 30 to 35. Box # 30 % Commercial Fertilizer, 75 Third St., N. W., Atlanta 8, Ga.

POSITION WANTED

Seek challenging opportunity in fertilizer production. Experienced granulation, related products. Maintenance, purchasing. Family. Late 30's. Degree chemical engineering. Box #27, % Commercial Fertilizer, 75 Third St. N. W., Atlanta 8, Ga.

EQUIPMENT FOR SALE

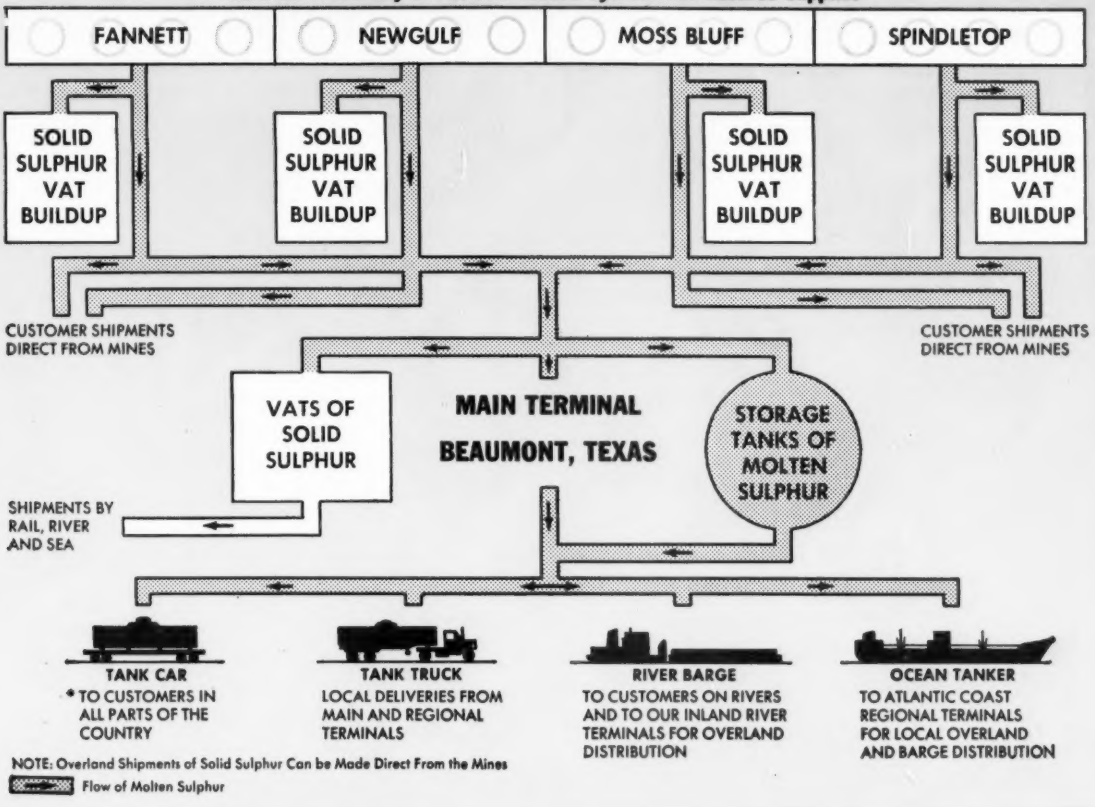
FOR SALE: Used, reconditioned Atlanta Utility Works 1½ ton batch mixer. Box #28, % Commercial Fertilizer, 75 Third St. N. W., Atlanta 8, Ga.

—— INDEX TO ADVERTISERS ——

molten sulphur

HOW TGS MOLTEN SULPHUR TRAVELS FROM FRASCH MINES TO CUSTOMERS

—Note the Flexibility of the Interlocked System that Assures Supplies—



Flexible Facilities to meet a Growing Demand

The rapidly growing demand for deliveries of sulphur in molten form—and it is coming from all parts of the country—is well-answered by the flexibility of our production, storage and distribution facilities.

Here, graphically, is the way TGS Molten Sulphur moves from the four Frasch Process producing areas in Texas to customers. Unusual flexibility enables us to do several things simultaneously. We can fill orders direct from the mines, build up inventory at our main terminal in Beaumont, Texas, ship to customers from this main terminal or supply our regional terminals.

We maintain steady production schedules at all properties. With flexible storage, shipping and delivery facilities of not only molten sulphur but solid sulphur, we are in a strong position to serve the sulphur-consuming plants all over the United States and Canada.*Our sulphur recovery plants (from natural gas) in Wyoming and Alberta take care of the demand in northwest United States and Western Canada for both molten and solid sulphur.

TEXAS GULF SULPHUR COMPANY

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